THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. JULY 23, 1896. CHICAGO, ILL. NUMBER 30.

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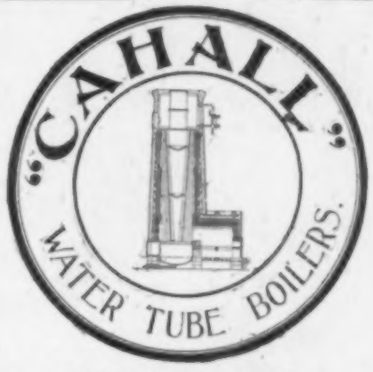

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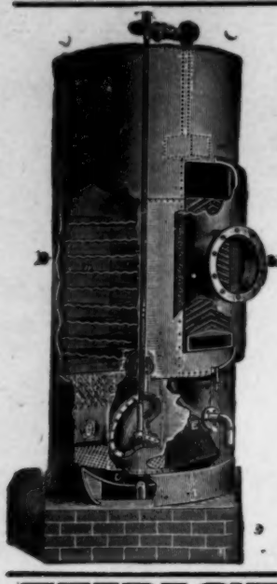

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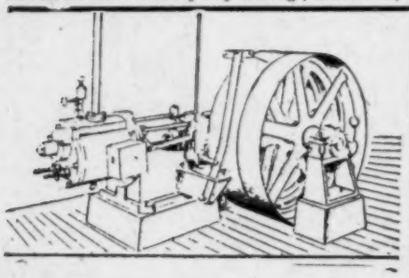

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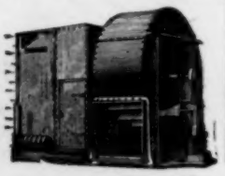

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. JULY 23, 1896. CHICAGO, ILL. NUMBER 30.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

A weakening in plates and angles, and low prices for iron and steel bars are noted in the market of the past week. Pig iron is under the same unsatisfactory conditions heretofore referred to, and the only expectation of a change is based on the restrictive policy that has been followed since the beginning of the month. A number of stacks active in June are now on the idle list, and there will be more blowing out and banking in the next few weeks. The Philadelphia meeting of Pennsylvania and Virginia furnacemen, last week, showed no dissent from the general proposition that there must be a vigorous reduction in the make of pig iron, but it was agreed also that action would have to be individual. It was decided that prices could not be advanced by organization; that the first requisite of betterment is less pig iron, and the second, the same confidence among buyers that is the great present need in every department of business. The pig iron figures for the first half of the year indicate an apparent consumption of 4,776,000 tons, deducting the stock accumulation of 200,000 tons from the output. Stocks in maker's hands for their own consumption in steel works and rolling mills are not included, nor are sold stocks on which delivery is overdue, and no account is taken of stocks carried in buyers' hands. These, however, are not large, as foundries and mills are very close to shore. It would seem that in spite of untoward conditions, the consumption of iron this year has been quite up to the record of 1892 or the early part of 1893. The steel market has developed no activity in the past week, and a 1,500-ton sale of billets in the Chicago district is the largest transaction on the pool basis. Not only are merchant mills that are buyers of billets, waiting, but their customers are holding off with them, so that the big mills, which have their own converters, are not getting the business that might be expected to flow to them under pool conditions. Prices on finished steel, particularly bars, continue to be made close to the actual pool price of billets. The tendency in all lines of finished material is to lower prices, but meantime the mills are booking little ahead, and there is little inducement for starting those that are idle because of unsettled wage questions.

THE CLEVELAND DISTRICT.

The reports from the Lake Superior district in the past ten days, have reflected the conditions that are now quite too well known among ore selling firms and furnacemen. The Vermilion range alone has been exempt from the reductions of forces and in some instances the almost entire suspension of work in certain shafts. Stockpiles have been growing at the mines, because of light sales or no sales for the ore, and producers who early in the season feared that under existing arrangements, they would not be able to produce as much ore as they could sell, now find that there is an uncomfortable balance the other way. It is quite certain now, in view of the banking and blowing out of furnaces in districts producing largely of Bessemer pig iron, that the amount of Lake Superior Bessemer ore mined in 1896 will be considerably beyond requirements. There are no indications that the ore market will change before fall; and then, if general business conditions are as they exist to-day, the ore and furnace interests will find a good deal of perplexity in deciding as to the future, since the tapering off of the navigation season will compel consumers either to purchase or to take chances on dock stocks. The vessel situation has improved slightly in the past few days, under a better movement of wheat, but ore chartering is almost at a standstill. Rates are nominally as before—60, 50 and 45 cents from Duluth, Marquette and Escanaba respectively.

Pig Iron. There will be further banking and blowing out by valley furnaces. In the Shenango valley, if present plans are carried out, there will be no furnaces active Aug. 1 except four at New Castle. The Shenango valley produced 297,181 tons of iron in the first half of the year, against 411,693 tons in the second half of 1895. Of the 297,181 tons, 251,156 tons was Bessemer. The Mahoning valley produced 332,633 tons in the first half of this year, against 332,491 tons in the second half of last year, almost an identical amount. Its Bessemer output, added to that of one Hanging Rock bituminous furnace producing Bessemer, was 170,860 tons in the first half of 1896, against 177,315 in the second half of 1895. The two valleys together had 181,189 tons of unsold stocks on June 30. There has been little iron sold the past week. Bessemer is quoted $11.50 at furnace on spot sales. Foundry is inactive. Forge has been offered at low prices and $9 at the furnace is reported in one instance. We repeat quotations as follows:

Bessemer	$12 25@12 50	Valley Scotch No. 1	$12 25
No. 1 Strong Foundry	12 00@12 25	Valley Scotch No. 2	11 75
No. 2 Strong Foundry	11 50@11 75	Gray Forge	10 25@10 50
No. 3 Foundry	10 75@11 00	Lake Superior Charcoal	13 50

Finished Material. The material for the Kirk-Christy building, about 500 tons, was let in the past week, being divided between Cleveland and Pittsburg. Another contract of the week consisted of 300 tons of bridge material. In plates and angles, the feeling is weaker, and tank steel has sold at 1.20c Pittsburg, though 1.25c is still the mill quotation. Prices are made according to the condition of order books. Bar iron and bar steel are weaker. On a Springfield, O., agricultural contract involving 4,500 tons of all kinds of material, the steel was sold very close to the pool price for billets and the bar iron was taken at a figure about $2 a ton below the pool price at valley mill. General demand is very light and consumers of finished steel whose business has regularly gone to certain merchant mills are holding off, in view of the inability of these mills to quote them, except at a figure proportioned to the pool price for billets. We quote beams and channels at 1.68c, Cleveland; tank plates, at 1.30c to 1.35c; angles, 1.20c to 1.25c; steel bars, 1.15c to 1.20c; bar iron, 1.20c. Old material continues weak. We quote old iron rails at $15; No 1. wrought scrap at $11; busheling scrap at $9; wrought turnings, $7.50.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, July 22

With possibly one exception, every branch of the iron trade was even more quiet last week than it was the week before. Only one order of any size was closed and even that would hardly be called a large one in better times. The local steel company reported a sale of 1,500 tons of billets. The rod mill at Joliet was shut down last Saturday night and will remain closed for an indefinite time. The mill has a number of good orders on hand but cannot get specifications.

PIG IRON.—Sales in the past week were confined to small lots and the total tonnage closed was hardly so large as the week before. This applies to both Northern and Southern irons. Inquiries are very light and it does not seem likely that buyers will place any very large orders within the next week. Prices are unchanged from our last report but can hardly be called strong. Quotations are as follows:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$10 60@10 85
Local Coke Fdy. No. 1	11 75@12 00	South'n Silveries No. 1	11 85@12 35
Local Coke Fdy. No. 2	11 25@11 75	South'n Silveries No 2	11 60@11 85
Local Coke Fdy. No. 3	11 00@11 25	Jackson Co. Silveries	14 50@16 00
Local Scotch Fdy. No. 1	11 75@12 00	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. o. 2	11 25@11 75	Ohio Silveries No 2	14 50@15 00
Local Scotch Fdy. No. 3	11 00@11 25	Ohio Strong Soften rs	15 00@15 50
South'n Coke No. 1	11 60@12 10	Alabama Car Wheel	16 85@17 35
South'n Coke No. 2	10 85@11 35	Malleable Bessemer	14 75@13 00
South'n Coke No. 3	10 60@10 85	Coke Bessemer	13 00@13 50
Southern No. 1 Soft	10 85@11 35		

BAR IRON.—No business of any importance was transacted last week. The demand is limited to small lots and is not likely to increase very soon. Prices are made as follows: Common iron 1.30c to 1.35c; guaranteed, 1.35c to 1.40c; soft steel bars from strictly billet stock, 1.30c to 1.35c.

RAILS AND TRACK SUPPLIES.—A fair business is being done in small lots but no large orders are had or are in view. Quotations are unchanged: Rails, $29; splice bars, 1.40c to 1.45c; track bolts with square nuts, 2.05c to 2.15c; hexagon nuts, 2.15c to 2.25c; spikes, 1.80c to 1.85c.

BILLETS AND RODS.—A sale of 1,500 tons of billets was made last week at $21.25. No inquiry is had for rods. The rod mill at Joliet closed down last Saturday because the steel company does not receive sufficient specifications on contracts to keep the mill running.

STRUCTURAL MATERIAL.—There is a dearth of new business in this market, only a very few small orders having come up in the last week. Specifications on contracts are a little slower than they were a week ago. Prices are inclined to be weak and plates have been reduced. Quotations are as follows: Beams and channels, 1.70c to 1.75c; angles, 1.35c to 1.40c; plates, 1.40c to 1.45c; tees, 1.55c to 1.60c. Small lots from stock are quoted 1-4c to 1-2c higher.

PLATES.—Only a few orders of small size were taken last week. The demand is light and the indications are that it will not be better right away. Prices are still weak and are revised as follows: Tank steel, 1.40c to 1.45c; flange steel, 1.60c to 1.65c, fire-box steel, 2.15c to 5c; boiler tubes, 70 to 75 per cent discount.

SHEETS.—Orders were few and small last week and the current demand is very light. Quotations are lower and are made at 2.25c to 2.30c for No. 27 black sheets, and 80 to 80 and 2 1-2 per cent discount for galvanized.

MERCHANT STEEL.—Business placed last week was of considerably smaller volume than the week before. Inquiries are lighter and orders are not expected to be so large in the immediate future. Quotations are made as follows: Open-hearth spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.55c to 1.65c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD RAILS AND WHEELS.—There appears to be no demand for old material of any kind and sales last week were very small. Old wheels are quoted at $12.50 to $13.50; old iron rails, $13 to $13.50; old steel rails, $9.50 to $10.

SCRAP.—The demand is very light and the few sales that have been made, were very small. The following are buying quotations furnished by dealers: Railroad forge, $10 to $10.50; dealers' forge, $9 to $9.50; No. 1 mill, $7; heavy cast, gross ton, $8.50 to $9; malleable cast, $8.50 to $9; axles, $14.50; cast borings, $3.50; wrought turnings, $4.25; axle turnings, $6.25; mixed steel, $7.25; stove plates, $6; heavy melting steel, $8.50 to $9.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, July 22.

All hope of improvement in the iron trade hinges on political developments and almost every line is at a standstill. Billets are not wanted and it is the opinion of many that the meeting of the pool next week could not help matters even though it should reduce the price. Mills are resuming but find little encouragement ahead. Southern iron at low rates has not induced purchases and little Northern iron is offered. The lines which seemed to be active last week have relaxed and the feeling is not so encouraging.

PIG IRON.—Southern furnaces have tried to tempt Pittsburg buyers in the week, by naming some unusually low figures, particularly on gray forge. The effort was useless, however, and if possible the week has been more quiet than its predecessors. The increasing number of banked furnaces removes somewhat the pressure to sell, noted a short time ago, but stocks are heavy and very low figures could be had if there were demand. Barring an occasional sale of foundry iron, nothing is moving.

Bessemer	$12.25 to $12 50
No 1 Foundry	12.00 to 12.25
No. 2 Foundry	11.50 to 11.75
Gray Forge	10.00 to 10 25

BILLETS AND RODS.—The price of billets is of little concern just now as steel cannot be sold at any price. Sheet bars are in some demand. Very small lots of billets have gone at $19.75 and $20 to brokers. Rods are not active, though one local mill has resumed operations.

STRUCTURAL MATERIAL.—Small orders have comprised the total of a very queit week's business. General conditions are reducing the business of an ordinarily good season and a slight falling off is noticed from last week. The contract calling for 600 tons of material for Greenville, Pa., was taken by the Penn Bridge Co., but no large work is being figured upon. The market stands as follows: Beams and channels, 1.55c; angles, 1.15c to 1.20c; universal plates, 1.30c; tees, 1.40c to 1.45c zees, 1.30c.

BARS.—Two Pittsburg mills have conditionally granted the $4.50 puddling rate and resumed to fill the orders accumulated during the shut down. There is no new business aside from this and they may run but a short time. Prices are as quoted below: Steel bars, 1.10c to 1.15c; all muck bar iron, 1.20c to 1.25c; common iron, 1.10c to 1.15c; with valley rates holding at 1.20c.

PLATES.—While plate orders are not so plenty as some time ago, the general trade is fair and mills are moderately booked. Low prices are again prevalent and while the general limit is 1.25c, plates have gone in the week at 1.20c and lower. Where orders are not of a size bringing out the sharpest competition, prices are maintained as given below: Tank, 1.25c; shell, 1.35c to 1.40c flange, 1.45c to 1.50c.

SHEETS.—With nearly all mills idle and demand very light, there is nothing of interest in the sheet market. Prices are occasionally below the general range as given below: No. 26, 2c; No. 27, 2.05c to 2.10c; No. 28, 2.15c to 2.20c.

WROUGHT PIPE.—Some local mills have resumed but conditions are not improved. The market is

steady and five 10's are quoted. The National Tube Works at McKeesport have resumed in nearly all departments, with a fair tonnage booked. At the National Rolling Mill the $4.50 puddling rate will be paid in accordance with the mill's custom of paying wages equal to the scale, but there is no change in the status of the mill.

OLD MATERIAL.—The scrap market shows no signs of returning activity and stocks are being still further increased. We continue quotations: No. 1 wrought scrap, $13 per ton; cast scrap, $10.50 gross; old steel rails, $12.50 to $13; old iron rails, $15.50; rolled iron axles, $17; hammered iron axles, $17 net; heavy melting stock, $13; coil springs, $13 to $13.50; car wheels, $11 to $11.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Philadelphia. The meeting of Pennsylvania and Virginia furnacemen held here last Wednesday resulted in an interchange of views but nothing more. It was agreed that a sharp restriction of production is necessary and a circular will be sent to furnaces competing in the Eastern market. Whatever blowing out or banking of furnaces comes as the result of present conditions will be prompted, however, by individual interest and not by any agreement. There is little change in prices; the tendency is still downward. For mill irons $9.50 to $9.75 delivered in the Harrisburg district and $10.50, seaboard, have been realized under recent cutting, and for No. 2X foundry $11.75 has been the basis of some sales. There is no regularity in the market, and all sales are the result of a feeling process, the seller grudgingly assenting to prices fixed by presumably tempting offers of unknown competitors. The increase in pig iron stocks suggests that there is only one remedy that buyers will not be persuaded of higher prices ahead until the supply is cut down and the current rate of production much reduced. In finished material reports vary. Some mills are fairly supplied with orders while others, generally the smaller mills, that have no converters, are booking little. Manufacturers expect a hand-to-mouth business for some time to come. In old material there is considerable difference in prices. For steel scrap, $12.50 has been accepted and some has sold, also, at $13 and at $13.25. Old iron rails are quoted $14, old steel rails at $12.50 and old car wheels at $12 to $12.50.

Buffalo. The increased interest which has been shown for some little time past in the low prices of foundry iron, has resulted in contracts being placed for a fair amount of iron, but nothing like the amount that should be moving at the present time in this vicinity. Most of the iron sold has been for immediate consumption, as neither the consumer nor the producer cares to contract very far into the future, at the present ruinous prices of foundry iron. Prices are nominally as follows, though all quotations have been shaded with the exception of those on charcoal iron: No. 1 strong foundry, lake ores, $13; No. 2, $12.50; Southern soft No. 1, $11.75 to $12; No. 2, $11.25 to $11.50; Ohio strong softener, No. 1, $12.75 to $13; No. 2, $12.25 to $12.50; Jackson county silvery No. 1, $14.25, Lake Superior charcoal, $13.50 to $14.

Cincinnati. The week under review has been the quietest of the summer, and yet a fair business has been done. Prices on Lake Superior charcoal iron are well maintained, but in every other class of pig iron all important sales have been worked out in each case independently and separately, as market prices are nominal. While the market is weak, buyers find most furnaces unable to meet their extreme views and demands as to prices. During the past ten days three important stacks in the South have been blown out and one has been banked; others must follow unless the market revives. In the Mahoning and Shenango valleys and in Pennsylvania several furnace companies will retire during the next fortnight. With the rolling mills nearly all closed down, and a limited consumption of pig iron at the foundries, the stocks at the furnaces have increased in July. Buyers are taking their iron on old orders a little more freely, relieving the furnaces somewhat of their surplus stock. The extraordinary depression of values in the stock and bond market, the continuance of cheap prices on all products, and the slender margin of profit anywhere in anything, makes the present condition a discouraging one; but many feel that everything now has been discounted and that general business is in the condition of a typhoid patient who has passed the critical period, and, though recovery must be slow, the optimists are very hopeful of a steady and continued improvement from the low level of today. We quote as follows: Southern coke No. 1, $10.25; No. 2, $9.75 to $10; No. 1, soft, $9.75 to $10; Lake Superior coke, No. 1, $12 to $12.50; No. 2, $11.50 to $12; Hanging Rock charcoal, No. 1, $15.50 to $16.50; Tennessee charcoal, No. 1, $13 to $14; Jackson county silvery, No. 1, $13.50 to $14; Southern coke, gray forge, $9 to $9.25; Mottled, $9 to $9.25; Standard Alabama car wheel, $14.75 to $15.50; Tennessee car wheel, $13.50 to $14.50; Lake Superior car wheel and malleable, $14.75 to $15.25.

LAKE SUPERIOR IRON MINES.

At the Rust mine, of the Lake Superior group, near Hibbing, Minn., the pumps were submerged by water recently, but it has again been overcome. The shaft is now down 165 feet. The water that has been so troublesome broke in from an underground stream, opening connection with what appears to be a natural drift about 6x4 feet, which has been explored for 75 feet. At the Hull mine adjoining the Rust, the water has been a great drawback also.

The Sellers mine on the Mesabi, is loading 75 to 80 cars daily, including 55 to 60 from stockpile.

At the Mahoning mine 2,000 cars of dirt are moved daily, in the stripping operations, and this will be increased to 2,500 to 3,000 on the arival of a new engine.

The No. 5 dock of the Duluth & Iron Range Road at Two Harbors is about completed and is one of the finest at upper lake ports. It is double, 1,000 feet long and 56 feet high.

The Minnesota Iron Co. is shipping 3,600 tons a day from its hard ore mines at Soudan and 3,200 tons a day from the Chandler. The Pioneer Iron Co. is raising and shipping 2,200 tons a day.

At the Vega mine, recently purchased by Joseph Sellwood and associates, the work this season will be principally in the way of development. Later in the year new machinery will proably be put in and the mine worked vigorously.

At the Dober mine at Iron River, Mich., operations are under the direction of Capt. Roberts. The machinery formerly used at the Mastodon mine will be moved to the Dober, and 5,000 tons will be got out as soon as possible.

The Chapin mine, at Iron Mountain, Mich., has reduced its force from 800 to about 500 men, owing to the condition of the ore market. Its stockpiles contain about 200,000 tons. At the Lake Superior Iron Co.'s properties, at Ishpeming, the recent laying off of 225 men may be followed by further curtailment. At the Winthrop, also at Ishpeming, the No. 2 shaft is likely to close down, and work may be discontinued in the open-pit.

In the week preceding July 12, shipments of ore from Ashland were 59,771 tons; for the season to that date, 711,857 tons.

The estimate on the whole season's shipment of ore from Two Harbors is 2,150,000 tons.

THE No. 1 blast furnace of the Carnegie Steel Co., at Duquesne, has been banked that alterations may be made. The work will consume a week, at the conclusion of which furnace No. 2 will be blown in and operated along with No. 1.

THE IRON TRADE REVIEW

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A HALF YEAR OF PIG IRON PRODUCTION.

The fact that impresses itself most strongly, in connection with the pig iron statistics for the first six months of 1896, is that the rate should have been kept so close to that of the second half of last year. The momentum of the boom spent itself before the end of '95, so far as the market was concerned; yet the furnaces of the country have kept within 382,000 tons, in the past six months, of their record-breaking production in the second half of last year—that is, within 14,712 tons per week. In other words, the net curtailment in these six months of unsatisfactory business has amounted only to the output of eight modern furnaces of average capacity. If maintained through the remainder of the year, the pace of the past six months would result in a total for 1896 but 48,000 tons short of 10,000,000 tons. The stock statistics, as well as current market reports, speak plainly enough of the congestion that has resulted, and suggest that the second half of the year may see a radical restriction.

The output of Besemer pig iron, which might have been expected, under the conditions surrounding the steel market, to fall off materially, was 56 per cent of the total. In the second half of 1895 it was 60 per cent of the total, and in the year, 59.5 per cent, as against 57.2 per cent in 1894, 50.9 per cent in 1893 and 48.5 per cent in 1892.

Counting out foreign ores, which have come in at an annual rate of about 900,000 tons since Jan. 1, and excluding also, by estimate, Bessemer iron made in certain districts from local ores, it would appear that the consumption of Lake Superior Bessemer ores in the first half of the year was something less than 4,000,000 tons. The rapid increase in basic steel production and the promised lessening of converter operations in the next few months, suggest that even with the reduction made in the first allotment, the production of Lake Superior Bessemer ore in 1896 will be more than ample for requirements. The events of the year have given added confirmation of the wisdom of the ore producers' policy.

Of the 200,000 tons increase in pig iron stocks since Jan. 1, the Mahoning and Shenango valleys have contributed 131,000 tons and the South 54,000 tons, leaving but 15,000 tons increase in all the rest of the country. The stocks in the two valleys are the largest on record, the Shenango valley having 110,092 tons on June 30, against 31,999 tons Dec. 31 and 12,100 tons June 30, 1895, and 54,764 tons at the close of 1894. The Mahoning valley had 71,097 tons, against 17,950 tons, 8,533 tons, and 26,316 tons respectively on the other dates mentioned.

Unsold stocks of charcoal iron grew but little more than 5,000 tons. On June 30 they were 140,693 tons; on Dec. 31, 135,033 tons; on June 30, 1895, 200,687; on Dec. 31, 1894, 250,183. Charcoal furnaces have kept production closer to demand in the past year than in the year preceding. In Michigan and Wisconsin, the output of charcoal iron was 85,761 tons in the first half of this year, against 70,162 in the second half of '95 and 67,017 in the first half. Stocks of charcoal iron in the two States were 36,435 tons on June 30; 29,994 on Dec. 31; 60,017 on June 30, 1895, and 82,515 on Dec. 31, 1894.

POLITICS AND INDUSTRY IN CANADA.

The recent political campaign in Canada, which resulted in the overthrow of the Conservative government, after 18 years of power, and the election of a Liberal majority in the House of Commons, duplicated in one feature the last presidential campaign in the United States. While the question of separate appropriations for Catholic schools was the issue that dominated, there was injected into the campaign much of the spirit of hostility to manufacturers, that was played on four years ago in the attack upon the protective policy in the United States. Laurier, the new Canadian premier, has been an outspoken opponent of protection, and has helped to make sentiment against a fiscal policy that would favor the home producer. The well-worn assertions of free traders were used in the late campaign, as in others, against the legislation that has been enacted by the Canadian government for the encouragement of home manufacturers. It was said that protection retards the growth of export trade, imposes on the consumer a higher price than he would pay under free trade, and lastly, that the people of Canada had brains and genius enough to cope with any other country in open competition, without the aid of protective duties. The fallacy and mis-statement contained in these familiar assertions have been gone over many times; but that they should be effective in making votes across the border, in full view of the sorry experience of the United States, in following the lead of the enemies of protection, is only surprising.

The *Canadian Manufacturer*, in commenting on the election result as affecting Canadian industries, finds some ground for hope in the proposition for the appointment by the new government, of a commission of experts, to investigate and report on the operation of the present tariff on the prosperity of the country and make recommendations as to its revision. The *Manufacturer* believes also, and the

history of the Wilson-Gorman bill confirms this, that government responsibility is apt to temper the license of the stump orator. It finds in the exaggerated and reckless campaign statements concerning the profits of manufacturing one reason for the popular feeling that politicians have turned to their own advantage, and notes that with the subsidence of election excitement the anti-protection press has become more conciliatory toward manufacturing industries.

It is safe to predict that the responsibilities of power will greatly modify the tariff programme of the new Canadian government, just as like responsibilities led the majority in the last Congress to enact a tariff bill that preserved scarcely one prominent feature of that originally proposed.

With this week the city of Cleveland enters on a series of demonstrations marking the 100th anniversary of the landing of Moses Cleaveland at the mouth of the Cuyahoga. The celebration of such a centennial in New Connecticut is a reminder that American cities, even in the younger portions of the country, are coming to maturity; and a study of census statistics, in the same connection, shows, too, that with cities like Cleveland age means accelerated, rather than retarded, growth. Iron and steel, from ore to wire nails, have contributed much to the enlargement that is the occasion of Cleveland's jubilation this week, and in the new century are destined to be of even more commanding importance.

The decline in prices of agricultural products has a large place in the free silver argument. But a more marked decline in the price of iron has gone on in the past 20 years, without exciting the slightest expression of concern from orators of the Teller stamp.

WEARING QUALITY OF STEEL RAILS.

The attention of engineers and steel-makers has been directed frequently in the past year to the relative wearing qualities of the steel rails turned out in recent years and those of 10 years ago and earlier, when the 56-lb. rail was almost exclusively used. *The Iron Trade Review* commented on the subject in connection with a meeting of Pennsylvania division superintendents a few months ago, to discuss the matter, as well as in connection with the paper of Robert W. Hunt, at the Atlanta meeting of the American Institute of Mining Engineers last fall, on rail specifications, and the purchase by the Illinois Steel Co., last spring of ores especially low in phosphorus, so as to reduce the phosphorus in its rail steel. The *Railway Age* now brings up the question afresh, in veiw of statements it finds in the daily press, that railroad managers are complaining that the wearing quality of steel rails furnished in the last five years is not up to the quality of those formerly supplied by the same makers. It quotes the assertion that 56-pound rails put in the track 10 years ago are comparatively in better condition today than 75-pound rails laid in the past five years. Against this is the following statement, also quoted from a New York daily paper:

"The rail mills allege that the difficulty arises in consequence of the section being unsuitable to the exigencies of modern traffic, and that there is no difference whatever in the quality of the steel. It is stated as a fact, nevertheless, that the rail is rolled in the mill fewer times now than it used to be."

The *Railway Age* asked manufacturers of steel rails for their opinions on the subject and received two letters, one from the Johnson Co., by President Moxham, and the other from the Pennsylvania Steel Co., by Supt. H. H. Campbell. These are as follows:

The Johnson Co.—"We cannot believe that the facts as stated are accurate. The rails of to-day as a rule are rolled from an ingot many times larger than was the case but a few years ago. The ores now put into Bessemer steel are more carefully graded and selected, and in their manufacture generally vast improvements generally have been made. There is every reason to believe that the quality of steel rails has improved, not deteriorated. The truth of the matter is that the demand put upon the rails has been almost revolutionized. If you compare the amount of traffic put upon the so-called 56-pound rail of some years ago with that put upon the 75-pound rail of today and get at the real truth of the matter, you will probably find that the later, on the important roads of the country, is sustaining more in one month—weight per wheel unit, speed and tonnage all considered—than the 56-pound rail of 10 years ago sustained in a year. There is on difficulty, however, in furnishing the steam railroads a finer grade of steel. They can have tool steel put in their rails if it answers their purpose, and they are willing to pay the bill. It is purely a matter of dollars and cents."

Pennsylvania Steel Co.—"We do not care to write any long article on the quality of the steel rails of today as compared with the quality of those made years ago; but we would call your attention to the fact, which you so well understand, that the weight per car wheel is very much in excess of what it was 20 years ago. It is evidently difficult to increase the bearing surface of the rail in proportion to this increased load. The increase in weight of the rail is in all parts of the rail, in the base, in the web and in the head, and it will often happen that in a worn rail of both kinds the bearing surface is the same on a light or heavy rail; hence, with the increased load the strain on the surface exposed to the wheel may be beyond the elastic limit; while with a lighter load it would be well within the elastic limit. In the first case the wear would be excessive, and in the latter case it would be reasonable. We think that this condition of affairs is responsible for the trouble, if there is serious trouble. We have not found any such complaints as you mention, and we think that as manufacturers of rails we ought certainly to have heard of them before the daily newspapers. There is one other minor point, and that is that the sharp angle for the fish plate under the head prevents the manufacturer from putting as much work on the head of the rail as he could if there were less of a sharp angle, and less than he could if the inspectors were not quite so rigid and would not throw out a rail if there was the slightest mark on the top of the head where the rolls had pressed it together. As for the statement that the rails are made with fewer passes today, it is doubtless true, but this should be an advantage rather than a disadvantage, since the metal is compressed much more by a heavy draft than by a light one."

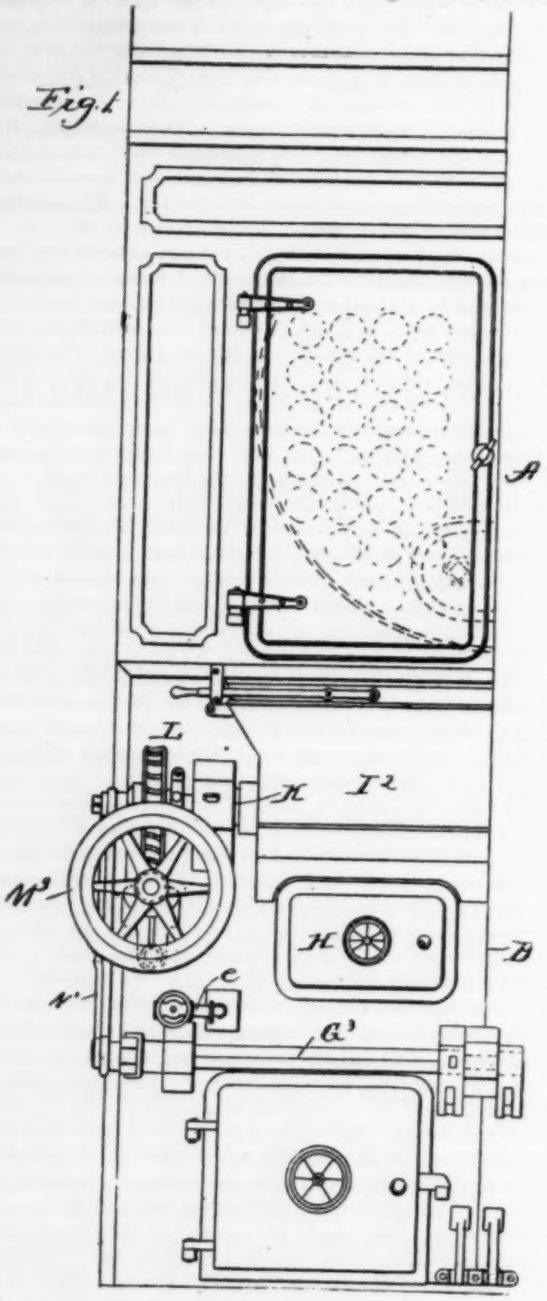
Our contemporary adds this comment: "That there is perplexity among both railway managers and rail manufacturers is undoubted. Rail failures occur and rail failures are serious things. Tremendous advance, however, has been made in the manufacture of rails of late years, and it may be safely stated that 15 years ago a rail could not have been furnished to stand the strains to which the rail of today is subjected except at a price which would have made its use practically impossible. The problem of adjusting the rail to the tremendous weights and shocks which are now thrown upon it is an extremely difficult one, but it is receiving the close attention of the best engineers, and the leading steel experts of the country. The standard weight of rail will undoubtedly in a few years be considerably above 75 pounds to the yard. Where the increase in the weight will stop, it is difficult at present to say. Questions of the best distribution of metal and a form of tread, of the roadbed and joints, all enter in a thousand ways into the decision of the minimum weight for safety under given conditions of traffic; and all of these things are entirely independent of and outside the questions of the quality of material and the methods of manufacture. Somehow engineers and chemists and manufacturers will succeed in keeping the rail up to the requirements of the traffic. Just at present, when these requirements have been increasing with such rapidity, it is not surprising that there should be uncertainty and, sometimes, failures."

MARSHBANK MECHANICAL STOKER.

A device for the regulation and the automatic feeding of fuel, adaptable also to hand-firing, should this be desired or necessary, has been patented by Andrew J. Marshbank, of Lansdale, Pa., and the patent has been acquired by David Fleming and Martin E. Hershey, of the Harrisburg Foundry & Machine Works, Harrisburg, Pa. The illustrations indicate the construction and operation of the device, Fig. 1 being a front elevation of one-half a furnace equipped with the stoker, Fig. 2 a vertical sectional elevation, Fig. 3 an enlarged detail section of the grate and Fig. 4 a top plan of it.

In the fire-box B, inclining downward from front to rear, are bearing-bars, those at the sides being hollow, and that

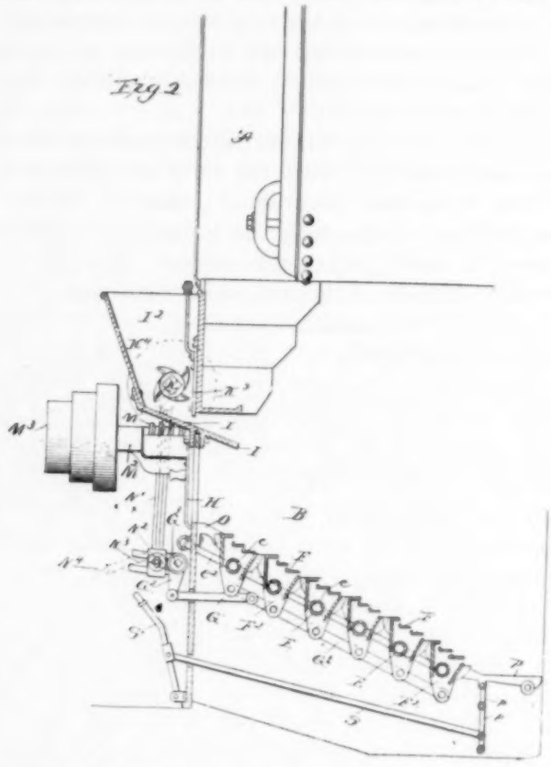
Fig. 1.



at the center being solid, but having a deep bottom web to insure strength, and all being provided with suitable bearings c for the ends of tubular grate-bar shafts E. The latter have openings e along their upper portions for the exit of steam or steam-charged air forced in by steam-jet nozzles e^1, located in the side bearing-bars, directed into the ends of the grate-bar shafts and supplied with steam through pipes e^2, Fig. 2, leading from the boiler or other source of steam supply.

Upon each grate-bar shaft is mounted a grate-bar having its upper surface in the form of a series of relatively narrow steps F, with slot-openings f in the risers for the admission of air to the fire-bed. The grate-bars are located at different levels, forming an inclined fire-bed, and along each edge of the bars there is formed a series of teeth or projections F^1, which intermesh with the teeth or projections on the adjacent bars, as shown in Fig. 4. Thus, while any fine ashes may work through as the grate-bars are rocked back and forth, no fuel can pass through. The bars are secured to their respective shafts by set-screws f^2, and it will be noted that the shafts discharge up within the grate bars, thus not only insuring a

Fig. 2.



full supply of air for combustion, but at the same time keeping the bars from burning out or warping.

The rocker-bar G is connected to a downward extension F^2 of each grate-bar and at the forward end it is provided with a connecting rod G^1, extending through the front of the ash-pit and connected to a crank-arm G^2 on a shaker-shaft G^3.

Fig. 3.

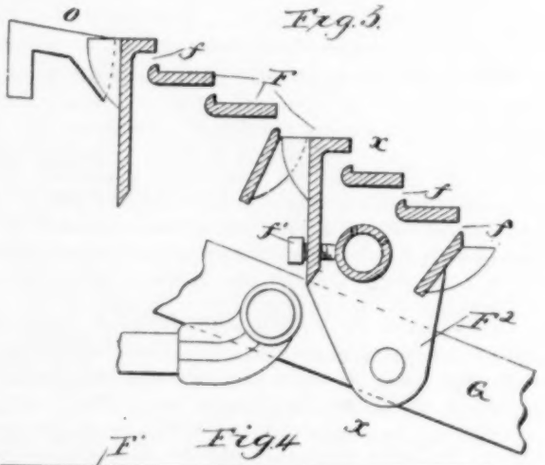
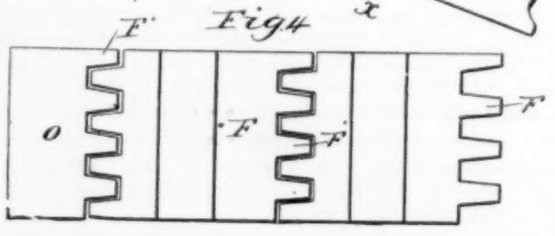


Fig. 4.



Above the upper end of the grate is an opening for hand-firing, normally closed, however, by a door H, and above this door is a second opening through which the fuel is automatically fed by the stoker. On the inside and at the bottom of this opening there is bolted an apron or feed-plate, I an outward prolongation of which, formed by the plate I^1, constitutes the bottom of the supply-hopper I^2, into which the fuel

is dumped and from which it is fed by the feed-roll down the inclined feed-plate I on to the upper end of the grate.

The feed-roll is formed by a square shaft K, carrying a series of hubs k, each provided with wings k' constituting the supports for the feed-roll blades K^2, bolted thereto. They are slightly curved in cross-section., and rotate immediately in front of the feed-opening, operating to draw fuel down and force it through the opening. The size of the opening may be adjusted by means of the sliding gate K^3. On one end of the shaft K, outside of the hopper, is a worm gear-wheel L, connected with the shaft through a clutch L′, having a shifting-lever or other means for controlling it. A worm M is in mesh with the worm-gear L, and the power for driving the worm is transmitted from any suitable source through one or the other of the cone of pulleys M^3 on the shaft M′. The worm gear-wheel L is also adapted to drive the shaker-shaft. By adjusting the pin N^2 in the slot bearings the amplitude of movement imparted to the shaker-shaft and consequent extent of movement of the grate-bars may be varied at will, and by disconnecting the connecting-rod N′ entirely the shaker-shaft may be operated by a hand-lever N^4, in dotted lines, shown in Fig. 2.

Fuel is prevented from escaping into the ash-pit at the top of the grate by a stationary grate-section O, secured to the front wall of the fire-box and having a toothed front edge into which the teeth on the top grate-bar fit, Figs. 3 and 4, and at the bottom of the grate the ashes, etc., are received on a horizontal dumping grate P, pivoted at the rear end and supported at the forward end on toggle-links p p, to one of which the dumping-rod S is attached and extended out to the front of the ash-pit, where it is connected with the operating-lever S′. By the employment of toggle-links the three pivotal centers of the links may be brought into alignment to support the dumping-grate in horizontal position, and at the same time leverage is secured for moving it.

In operation the fuel is dumped into the hopper and the pulleys M^3 bolted to any suitable source of power. The rotation of the pulleys through the worm-gear connections rotates the feed-roll, giving a constant and even supply of fuel over the feed or dead plate down on to the upper portion of the grate. The rate of feed is governed by the speed at which the pulleys M^3 are driven. Simultaneous with the feeding of the fuel the grate-sections are oscillated by means of the connecting-rod and cranks, and should it be desirable at any time to operate the latter mechanism without operating the feed-roll it may be done by throwing the clutch L′ out of engagement, disconnecting the shaft K from its drive-wheel. Fuel may then be supplied by hand through the opening immediately above the gate.

Increasing Production of Gold.

Director Preston of the Mint Bureau, the highest authority on the subject in the world, estimates that the world's production of gold for the year 1896, will be not less than $220,000,000. It is expected that the United States will show an increase this year from $47,000,000 in 1895 to $50,000,000. The United States stands at the head of gold-producing countries. Considerable increases are looked for in Australia, South Africa and Russia. The estimated consumption of gold in the arts is about $50,000,000, leaving a balance of $170,000,000 for money uses. The Mint Bureau in 1894 made the prediction that the supply of gold available each year for monetary uses would soon equal the united supply of gold and silver available for such uses at the time when free coinage was suspended in several countries and the gold standard was adopted by the German empire. That time has now come.

A receiver was appointed July 18 for the Middletown Car Works, Middletown, Pa., one of the largest of Dauphin counties' industries. The complaint was presented on behalf of the Susquehanna Iron Co., Columbia, a creditor, for $4,519, and the Pennsylvania Nut & Bolt Works, Lebanon, which holds judgments amounting to $4,213. The Middletown Car Works is the third concern of the kind in Dauphin county to go into the hands of receivers within the past five years.

THE July meeting of the shafting manufacturers of the country will be held at Boston on the 27th and 28th.

CONDITION OF BLAST FURNACES OF U. S.*

July 1, 1896.

Location of Furnaces.	Coke and Anthracite					Charcoal.				
	Total No. of Stacks.	In Blast.		Out of Blast.		Total No. of Stacks.	In Blast.		Out of Blast.	
		Number.	Weekly capacity.	Number.	Weekly capacity.		Number.	Weekly capacity.	Number.	Weekly capacity.
New York	19	4	4452	15	7938	5	1	113	4	440
New Jersey	9	1	686	8	3477	.....	.....	.....	.....	.....
Spiegel	3	2	208	1	65	.....	.....	.....	.....	.....
Pennsylvania:						13	1	53	12	685
Lehigh Valley	39	11	6026	28	13142	.....	.....	.....	.....	.....
Spiegel	1	1	97	0	0	.....	.....	.....	.....	.....
Schuylkill Valley	27	9	5619	18	8864	.....	.....	.....	.....	.....
Upper Susqu. Val.	13	4	2701	9	3154	.....	.....	.....	.....	.....
Lower Susqu. Val.	15	4	2164	11	6220	.....	.....	.....	.....	.....
Spiegel	1	1	380	0	0	.....	.....	.....	.....	.....
Lebanon Valley	13	5	2934	8	4690	.....	.....	.....	.....	.....
Pittsburgh	26	21	40868	5	7589	.....	.....	.....	.....	.....
Spiegel	1	1	500	0	0	.....	.....	.....	.....	.....
Shenango Valley	16	9	12174	7	6777	.....	.....	.....	.....	.....
Jun. and Con. Vals.	15	9	7836	6	5120	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	500	.....	.....	.....	.....	.....
Youghiogheny Val.	3	1	1102	2	1300	.....	.....	.....	.....	.....
Miscellaneous	4	2	1418	2	1250	.....	.....	.....	.....	.....
Maryland	5	1	2207	4	5500	4	0	0	4	342
Wheeling District	9	5	5632	4	3352	.....	.....	.....	.....	.....
Ohio:						9	3	149	6	504
Mahoning Valley	11	6	6616	5	4452	.....	.....	.....	.....	.....
Central & Northern	10	8	9569	2	3132	.....	.....	.....	.....	.....
Hocking Valley	12	1	817	11	2293	.....	.....	.....	.....	.....
Hanging Rock	13	7	2085	6	2015	.....	.....	.....	.....	.....
Indiana	2	0	0	2	412	.....	.....	.....	.....	.....
Illinois	16	12	21029	4	5803	.....	.....	.....	.....	.....
Spiegel	1	1	1576	0	0	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	4	3459	0	0	3	1	816	2	585
Missouri	2	0	0	2	1850	1	1	352	0	0
Colorado	3	1	1031	2	1300	.....	.....	.....	.....	.....
Virginia	24	10	7031	14	7335	13	0	0	13	827
Kentucky	6	3	1547	3	1550	3	0	0	3	200
Alabama	39	17	17004	22	11710	13	3	827	10	2725
Michigan	.....	.....	.....	.....	.....	20	8	3430	12	4146
Tennessee	13	7	5273	6	4672	9	2	441	7	980
Georgia	2	0	0	2	822	3	1	200	2	230
North Carolina	1	0	0	1	90	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	2	110	9	920
Texas	.....	.....	.....	.....	.....	4	0	0	4	580
Washington	.....	.....	.....	.....	.....	1	0	0	1	150
Oregon	.....	.....	.....	.....	.....	1	0	0	1	200
Totals	380	168	174041	212	127033	113	23	6191	90	13508

SUMMARY.

Fuel.	In Blast.						Out of Blast.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	23	19	17	6,491	5,471	3,879	90	94	13,508	13,884
Coke and Anthracite	168	175	168	174,041	176,749	167,315	212	204	127,033	119,668
Total	191	194	185	180,532	182,220	171,194	302	298	140,541	133,552

*The above table is condensed from the *Iron Age*. The tables of the *American Manufacturer* show in blast July 1, 191 furnaces, with 210,429 tons weekly capacity instead of 180,532 as above.

THERE is now practically no doubt of all of the Rockefeller ships carrying full 4,000 gross tons from Lake Superior on the present draft of about 14 feet four inches. The first of these ships, the Sir Henry Bessemer, has just delivered at Cleveland from Ashland 4,051 gross, or 4,537 net tons, which is the largest cargo of any kind ever moved from Lake Superior. But 4,000-ton cargoes will be small next season, when dredging operations throughout the rivers afford to vessels of this kind of draft of water equal to the greatest depth that can be had at Lake Erie ports. Predictions in this regard might be wide of the mark just now, but it is certainly reasonable to expect that 6,000-ton loads will be as common next year as those of 4,000 tons are at present. The barge Aurania, owned by John Corrigan, of Cleveland, has again taken first place among the steel tow barges in the Lake Superior trade. She is now bound down from Duluth with 4,034 gross, or 4,520 net tons of ore.—[Marine Review.

THE Akron Iron & Steel Co., Akron, O., which has been running full since the new management took hold of the property, in May, 1895, the greater portion of the time double turn, will close down about Aug. 1 for a week's repairs. A three-high roughing train will be put in and boiler and engine repairs made.

PIG IRON PRODUCTION, FIRST HALF OF 1896

The statistics just gathered by General Manager Swank of the American Iron and Steel Association, and given in detail in the tables below, show that the total production of pig iron in the United States in the first half of 1896 was 4,976,236 gross tons, against 4,087,558 tons in the first half of 1895 and 5,358,750 tons in the second half of 1895. As compared with the first half of 1895 there was an increase in the first half of 1896 of 888,678 tons, and as compared with the second half of 1895 there was a decrease of 382,514 tons. The following table gives the production by States. It shows that, as compared with the second half of 1895 the following States increased their production: Connecticut, New York, New Jersey, Maryland, Virginia, North Carolina, Illinois, Michigan and Wisconsin. Alabama, Tennessee and Kentucky made an almost identical output, with that in the second half of '95:

TOTAL PRODUCTION OF PIG IRON.

States.	Blast Furnaces.				Production. Gross tons of 2,240 lbs. (Includes spiegeleisen.)		
	In blast Dec. 31, '95.	June 30, 1896.			First half of 1895.	Second half of 1895.	First half of 1896.
		In	Out	Total.			
Massachusetts	1	1	2	3	2,194	2,516	893
Connecticut	1	2	4	6	2,438	3,177	3,656
New York	6	5	18	23	88,309	93,333	99,870
New Jersey	4	3	9	12	28,112	27,390	34,435
Pennsylvania	103	79	99	178	2,087,381	2,613 782	2,246,753
Maryland	1	1	8	9	.....	10,916	51,807
Virginia	17	11	17	28	142,580	204,009	231,685
North Carolina	1	.....	2	2	.....	323	2,151
Georgia	2	1	4	5	11,535	19,490	7 593
Alabama	22	20	30	50	390,553	461,114	464 205
Texas	1	1	3	4	2.502	2,180	1,131
West Virginia	3	2	2	4	62,567	79.401	68,421
Kentucky	4	3	6	9	19,285	44,495	44.450
Tennessee	8	9	12	21	114,169	133,960	134.354
Ohio	40	31	33	64	632,571	831,218	743,444
Indiana	.....	.....	2	2	.....	.....	.....
Illinois	15	13	4	17	376,401	629,690	638,186
Michigan	6	8	8	16	45 868	45.354	65,193
Wisconsin	5	4	2	6	53,750	94,650	102,586
Minnesota	.....	.....	1	1	.....	.....	.....
Missouri	1	1	3	4	2.267	25,251	4,758
Colorado	1	1	2	3	25,016	33,492	30,665
Oregon	.....	.....	1	1	.....	.....	.....
Washington	.....	.....	1	1	.....	.....	.....
Total	242	196	273	469	4 087,558	5,358,750	4,976,236

Production according to fuel the past half year, and the two six months periods preceding, is shown in the next table, together with stocks of anthracite, bituminous and charcoal iron at the end of the last four periods of six months:

STOCKS AND PRODUCTION ACCORDING TO FUEL.

Fuel.	Stocks. Gross tons of 2,240 lbs.				Production. Gross tons of 2,240 lbs. (Includes spiegeleisen.)		
	Dec 31, 1894.	June 30, 1895.	Dec. 31, 1895.	June 30, 1896.	First half of 1895.	Second half of 1895.	First half of 1896.
Bituminous	227,907	129,596	193,363	390,883	3,497,078	4,452,990	4,155,528
Anthracite	119,598	109,007	115,936	113,311	487,479	783,420	684,011
Charcoal	250.183	200,687	135,033	140,693	103,001	122,340	136,697
Total	597,688	439.290	444.332	644.887	4.087 558	5,358.750	4,976,236

The quantity of spiegeleisen and ferro-manganese produced in the first half of 1895 was 73,011 gross tons; in the second half, 98,713 tons; total, 171,724 tons. In the first half of 1896 the quantity of spiegeleisen and ferromanganese produced amounted to 83,010 tons.

Unsold stocks June 30, 1896, show a marked increase over the unsold stocks on Dec. 31, 1895. On June 30 the stocks which were unsold in the hands of manufacturers or their agents, and which were not intended for their own consumption, were 644,887 gross tons, against 444,332 tons on Dec. 31, an increase of 200,555 tons, or over 45 per cent. These figures do not include pig iron sold and not removed from the furnace bank, nor pig iron manufactured by rolling mill proprietors for their own use. Included in the stocks of unsold pig iron on June 30 were 51,040 tons in the yards of the American Pig Iron Storage Warrant Co., which were yet under the control of the makers. The amount in these yards not under their control was 60,960 tons, which, added to the 644,887 tons above mentioned, makes a total of 705,847 gross tons of unsold pig iron on the market June 30, against 506,132 tons, Dec. 31, 1895.

TOTAL STOCKS OF UNSOLD PIG IRON.

States.	Gross Tons of 2240 lbs.			
	Dec. 31, 1894.	June 30, 1895.	Dec. 31, 1895.	June 30, 1896.
New England	12,019	11,172	9,058	8,447
New York	36,705	33 373	30.771	36,940
New Jersey	11.291	7,289	9,402	7,015
Pennsylvania	188,217	126,536	159,788	243,800
Maryland	4,459	2,414	1,624	1,425
Virginia	40,779	31,580	33,236	51,499
North Carolina, Georgia and Texas	21,554	20,629	18,953	19,757
Alabama	78,130	50,969	67 070	92,669
Kentucky	5,972	8.721	6,886	15,314
Tennessee	17.853	11,234	9.279	11,611
Ohio	66 046	53,386	49.169	113,111
Michigan, Indiana and Minnesota	74,672	56,370	23.040	28,656
Illinois and Wisconsin	7,843	3,647	14,119	7,829
Missouri and Colorado	30,948	20,770	10,767	5,503
Pacific States	1,200	1,200	1,200	1,191
Total	597,688	439,290	444.332	644.887

The production of pig iron of Bessemer quality in the first half of 1896 was 2,793,672 gross tons, against 2,402,023 tons in the first half of 1895 and 3,221,672 tons in the second half. The decreased production of 428,000 tons in the first half of 1896 as compared with the second half of 1895 is doubtless due in large part to the increasing demand for open-hearth steel and particularly for basic steel made in the open hearth. For the first time, the Association has ascertained the production of basic pig iron. In the first half of 1896 it amounted to 190,595 gross tons, distributed as follows:

New York and New Jersey	6,171
Pennsylvania—Allegheny county	88,573
Pennsylvania—Other counties	38,875
Virginia and Alabama	47,546
Ohio and Wisconsin	18,430
Total tons	199,595

The tables below give the production of Bessemer pig iron by States, and in the various districts of Pennsylvania and Ohio.

PRODUCTION OF BESSEMER PIG IRON.

States.	First Half of 1895.	Second Half of 1895.	First Half of 1896.
New York	6.473	5,465	.....
Pennsylvania	1,530,410	1,900.470	1,552,378
Maryland	.....	10,916	50,807
West Virginia	62,567	79,401	68,421
Kentucky	.....	10.000	600
North Carolina	.....	323	2,151
Ohio	446.754	584,981	499,299
Illinois	325,968	559,776	575,215
Michigan	1,789	.....	.....
Wisconsin	4,027	12,952	14,0 8
Missouri	687	25,251	3,198
Colorado	23,348	32,137	27,535
Totol	2,402,023	3,221.672	2,793,672

BESSEMER PRODUCTION IN PENNSYLVANIA AND OHIO.

Pennsylvania.	Lehigh Valley	46,758	93,735	76,437
	Schuylkill Valley	26,134	59,738	20,068
	Upper Susquehanna Valley	38,199	55,031	58,962
	Lower Susquehanna Valley	151,948	227,804	158,250
	Juniata Valley	.....	.....	.....
	Shenango Valley	312,696	371,929	251,156
	Allegheny County	813,003	912,598	860,762
	Miscellaneous bituminous	141,672	179,635	126,743
	Mahoning Valley and H. Rock bit	185,541	177,315	170,860
Ohio.	Hocking Valley	9,041	20,190	10,515
	Lake Counties	110,563	167,857	127,361
	Miscellaneous bituminous	141,609	219,619	190,563

Ohio's production of Bessemer pig was second throughout 1895 but Illinois has again taken the place it held previous to last year. For the first half of the present year the output of Bessemer pig in Illinois was the largest ever made by that State, an index of the pronounced expansion of the Illinois Steel Co.'s business in the past year.

In the present low state of the iron trade, Embreville Furnace, Embreville, Tenn., is an exception to the general rule of extremely low prices and large stocks. There are orders enough for its malleable pig iron to keep the furnace running at full capacity for six or seven months. Iron on these orders is being called for faster than it can be delivered. The stock on hand is small, and most of it is already sold for delivery through the next six months. The special feature of the Embreville iron is its great tensile strength, comparing favorably with the famous Salisbury iron of Connecticut. Some of the work recently done by the furnace shows good results; 2,300 pounds of iron being made on a coke burden of 2,450 pounds. The newly built ovens of the Virginia Coal & Iron Co., at Big Stone Gap, are supplying all the coke, which is of good quality and analysis, and comparing favorably with Connellsville coke in burden carrying.

PUBLICATIONS RECEIVED.

"Vandergrift Ready" is the title of a publication by the Apollo Iron & Steel Co., bound in hand-made deckle-edge paper and illustrated with attractive half-tone engravings and wash-drawing reproductions. The new town is 38 miles from Pittsburg, and is on the west bank of the Kiskiminetas just below Apollo, the present seat of the Apollo mills. The new works will start in September. They consist of steel works, 1120x80 feet; sheet mill, 800x140 feet; annealing building, 200x80 feet, and boiler house, 256x45 feet. The plant is on the river and the town has the river on three sides, being located on a bend. There are 814 lots in the town as laid out. Of these 300 have been sold to employes and 200 are reserved for business. The prices of residence lots based on average sales in Apollo in the past five years are from $750 to $1,050 for 25x120 feet.

The latest of the "Nuggets of Information" issued by Rogers, Brown & Co., gives June prices on Southern No. 2 foundry, Niagara, Jackson county silvery and Lake Superior charcoal in the past six years, together with high and low prices of grain, silver and wool in the same years.

Timmis & Clissold, Bound Book, N. J., devote a recent pamphlet to pattern shop supplies and machinery. Brass dowels, a specialty with this firm, come first, and their value is emphasized, as against wood pins. In later pages rapping plates and keys, pattern letters and other supplies, and the machinery required in the pattern shop — trimmers, jointers, lathes, etc.,—are described and illustrated.

In their last pamphlet, H. E. Collins & Co., Pittsburg, sales agents of the Cahall patent vertical water tube boiler, give exhaustive reports of tests of a Cahall boiler, under the observation of Thos. Pray, Jr., consulting engineer, of Boston. The boiler was at the plant of the Armstrong Cork Co., Pittsburg, and in connection with it was a Hawley down draft furnace. The report on the test of May 4 shows 9.6347 lbs. of water evaporated per lb. of dry coal from actual pressure and temperature, or 11.429 lbs. of water per lb. of dry coal, at and from 212° F, or 13.968 lbs. of water per lb. of combustible at and from 212° F. The intention was in this test to run the boiler at about 10 per cent above its rated capacity of 250 h. p. The horse power developed, according to the American Society of Mechanical Engineers' code, was 257.55. The efficiency of the boiler's performance in percentage of the theoretical value of the coal was 85.862. In the test of May 5, the boiler developed 416.055 h. p., an excess of 66.422 per cent over the maker's rating, with an efficiency of 10.22 lbs. of water at and from 212° F. with one pound of dry coal. Mr. Pray says that the test for capacity "is one of the best I have seen, in over 4,000 boilers already tested."

A recent folder gives detailed information concerning the C. B. attachment, illustrated some time ago in these columns. It is manufactured by the C. B. Attachment Co., office 10 Warren st., New York. R. M. Cramer is president of the company, J. N. P. Cramer, secretary and treasurer and Geo. W. Collin, general manager. The attachment is designed for return tubular boilers and the claims for it are that it saves fuel, prevents the formation of scale, keeps the boiler clean and is a feed water heater of novel construction, generating steam when not acting as a feed water heater.

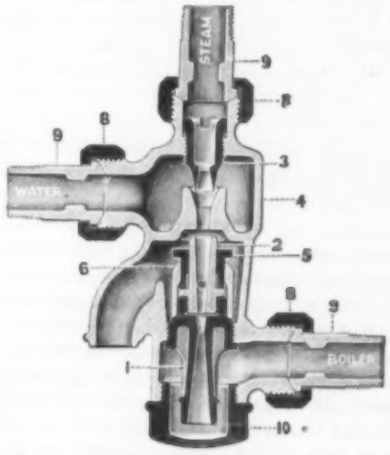
The Buffalo disk wheels as applied to heating, ventilating and cooling, are illustrated in a pamphlet just issued by the Buffalo Forge Co., of Buffalo' N. Y. These wheels are stiffly braced in all parts and have strength of vein and blade adapting them to most difficult conditions. Their special adaptations are to uses requiring the movement of large volumes of air where there is free delivery to and from the fan. The illustrations show the Buffalo disk wheel with direct attached electric motor, as belted to electric motor, and as applied with pipe connections. The removal of smoke, steam, gas, bad odors, hot air, etc., from factories, engine rooms, foundries, blacksmith shops, etc., is one line of service in which this fan has been largely used.

The Sykes Steel Roofing Co., Niles, O., and Chicago, Ill., has issued its 18th annual illustrated catalogue. The company manufactures Sykes patent improved standing seam roofing, and V-crimped, corrugated roofing and siding and sheet metal clapboarding, corrugated and beaded ceilings, sheet steel brick, etc., from sheet iron and steel, either black, painted or galvanized. At the World's Columbian Exposition it received a medal and a diploma, its "patent cap steel roofing" receiving the award "for lasting qualities, improved devices for fastening the metal, strength, lightness, and proof against fire and lightning." The new catalogue is attractively arranged and illustrates some new specialties in metal working and roofing operations.

AUTOMATIC RESTARTING INJECTOR.

The Sellers automatic restarting injector, manufactured by Wm. Sellers & Co., Inc., of Philadelphia, is designed for stationary, portable, traction and hoisting engines, tug boats, etc. A sectional view is given in the accompanying cut.

The branches for steam, water supply and delivery to the boiler are arranged so that all the pipes may be placed against the boiler wall. The overflow is directly under the water branch and can be provided with a drip funnel and discharge pipe, without bending or springing the other pipe connections. The steam nozzle and delivery tubes are screwed into the body, and do not depend upon the pressure of the steam or of the delivery to hold them in place, so that there is no danger of leakage at these important shoulders. The body and tubes are constructed of bronze. The injector is automatic in its action, restarting instantly after a temporary interruption of



the steam or water supply, and raising the feed promptly on long lifts, with hot or cold pipes.

Steam enters at the top and passing down through the steam nozzle, 3, discharges through the draft tube into the overflow chamber and thence to the air, lifting the water to the injector. The partial vacuum caused by the condensation of the steam within the combining tubes raises bushing 5 up against the draft tube and holds the lower bushing, 6, against the delivery tube, thus preventing the admission of air. Upon removing the cap at the lower end of the body the end of the delivery tube will be seen projecting below the lower face of the body, so that a monkey wrench may be used to unscrew this tube, drawing out the tubes and the overflow bushings at the same time.

The size numbers of these injectors are based upon the diameter of the delivery tube expressed in tenths of millimeters. No. 16 is 1 6-10 millimeters in diameter. The system of manufacture is such that the pipe sizes and proportions having once been determined, they are strictly maintained by having parts made to a perfect system of gauges. They are thoroughly interchangeable and, although the injector may have been in service until quite well worn, a new tube or part can be furnished that will fit perfectly and give the same results as the original. There are no levers and no fittings except ordinary globe valves are required.

The selling agents are Jenkins Bros., of 71 John st., New York.

THERE are 371¼ grains of pure silver and 41¼ grains of copper alloy in the American standard silver dollar, and 23.22 grains of pure god and 2.58 grains of silver and copper alloy in the gold dollar. The full weight of the gold dollar is 25.8 grains, and the silver dollar is 16 (or to be entirely accurate 15.98) times as heavy, or 412½ grains.

THE WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, July 15, at the Great Northern Hotel, Chicago. The president occupied the chair.

The following were present: F. M. Lyon, Burlington Route Foundry, Aurora, Ill.; A. W. McArthur, Rockford Foundry Co., Rockford, Ill.; John Pettigrew, Illinois Steel Co., W. N. Moore, Joliet Stove Works, Joliet, Ill.; A. N. Wheeler, F. C. Patten, F. C. Patten Co., Sycamore, Ill.; H. L. Hotchkiss, F. G. Coffeen, Deering Harvester Co.; Maj. Malcolm McDowell, Hanson McDowell, McDowell Steel Co.; H. S. Vrooman, Garden City Sand Co.; Wm. Ferguson, E. E. Hanna, Gates Iron Works; John K. Mackenzie, R. N. Dickman, Dickman & Mackenzie; D. Evans, Forster, Waterbury & Co.; S. T. Johnston, Whiting Foundry Equipment Co.; A. Sorge, Jr., M. E.; H. F. Frohman, S. Obermayer Co.; A. M. Thompson, Link Belt Machinery Co.; D. H. Truesdale, Cribben & Sexton; Eugene W. Smith, James Marshall, Crane Co.; John Rogers, Home Stove Works, all of Chicago.

J. B. Clements, of St. Louis, Mo., applied for associate membership in the association and on motion was elected.

The secretary announced that at the last meeting of the board of directors it was decided on a motion duly passed that no regular meeting of the association be held in August. He also stated that the next meeting would be held in Cleveland in September and that notices will be sent to the members as soon as they are ready.

The paper of the evening, "Practical Value of the Various Metalloids in Cast Iron," was then read by its author, Maj. Malcolm McDowell.

Discussion.

Mr. Dickman, who was called upon, said: While I appreciate your courtesy, I feel at the present time I am a little too rusty on this subject to speak of it. Some year and a half ago I had the pleasure—as well as a small amount of labor—of going through an analogous set of experiments for Mr. Keep, but about that time my attention was turned into a different channel of work and since then I have not been doing much in that line. I may state, however, that both for the scientific interest that we take in such matters, and for the general good that seems apt to result from a systematic investigation of the influence of these metalloids, Mr. Mackenzie and myself will offer to this association our assistance in these experiments, and assure you that our part of the work shall receive our best attention, and the benefit of our experience in the chemical part.

Mr. Pettigrew: Away back in the sixties one of the smartest men in the country took hold of pig iron and this was Gen. Rodman. He took hold of the Ft. Pitt foundry and made a very decided success in casting his cannon. He had the United States Government at his back. His idea was to have the outer coat of the gun keep a tight hold of the inner coat, and he was successful. He was the first man that ever introduced water into the cores, and he did it successfully. After the cannon was cast he turned on a stream of water right into the core and tested the temperature of the water until the gun was thoroughly cold. At the same time he governed the fire on the outside of the cast to keep the outside of the gun hot. Most of you gentlemen that have seen castings broken have noticed that the castings straighten out instead of rolling up. Gen. Rodman's guns always rolled up when broken.

Mr. Sorge: The paper outlines a very exhaustive and complete line of work, which should be taken up by the Western Foundrymen's Association. The determination of the exact effect of the varying percentages of each metalloid in cast iron has been attempted partially by various experimenters, but there has never been a systematic series of experiments made on this subject. Everyone of us that mixes iron for castings and uses chemistry in doing this has a theory of his own on which he works to produce certain results. Maj. McDowell has his and I have mine. Whether they agree or not I do not know. It is a matter of shop secret and each man keeps that thing to himself. I do not think this is best, however. I think that sort of thing is improved very materially by discussion and whatever theory an individual has can only be based on his own limited knowledge. But if the work outlined by Maj. McDowell in his paper is carried out, it will give us a series of demonstrations that will enable us to state intelligently what the exact effect of each one of the metalloids will be. I consider it so valuable a paper that I think our association should take it up by appointing a committee for the purpose of carrying out these experiments. It is going to be a matter of considerable expense and one that the association must not lose patience about. It will take one, two, or three years, possibly more, to work this out and the chances are that they will find great difficulty in obtaining the mixtures containing the exact amounts of the different metalloids desired, and it is going to take patience to get them. I think it is the most important thing, without exception, that is today before the foundrymen and I hope to see the Western Foundrymen's Association take hold and carry it through to a successful issue. I believe it can be done. As to entering into the details that Maj. McDowell has brought forward, I think it is too early to theorize. I think that, until we have these experiments before us and have the results in tabulated shape so that we can intelligently look them over, we had better not theorize. There was another point which I failed to make. Mr. Dickman spoke of the series of experiments made by Mr. Keep. These papers have not yet come out, but they will at the next meeting of the A. S. M. E. We have received parts of them, but the fact is that the line of experiments was entirely in the direction of demonstrating the effect of silicon. Even there the tests were made to establish a standard of test bars more than to demonstrate the effect of the various metalloids.

Mr. Moore: I thoroughly agree with the writer of the paper on the desirability and necessity of the work that he has outlined, and I sincerely hope that this association can be instrumental in carrying it out. I, from my limited expeirence, have reason to doubt what little I sometimes think I know about the subject and for the reason that there are so many combinations of elements dealt with that when one thinks he has arrived at a point where he knows something and can put a peg down, before he has gone very much further he finds that the thing he thinks was true is true only under certain conditions. As an illustration of that: Some time ago we had trouble in our castings from shrink-spots. The castings to which I refer are light castings and the shrink spots occurred where there were lugs or extra thickness. We found that we were running low in phosphorus, about one-half of one per cent. Our silicon was what we considered normal, between two and one-half and three per cent. We put our phosphorus up about one-quarter of one per cent, and we found that our trouble disappeared. There was no other change in the conditions. We set a peg down there that one-half of one per cent phosphorus is liable to produce shrink spots and that three-quarters of one per cent is all right. Well, that stood as good law until recently when my attention was called to a casting which had those identical shrink-spots in it and an explanation was asked to account for them. I said it looked like low phosphorus. The casting was analyzed and showed three-quarters of one per cent phosphorus. The law was good until we struck some other combination and then the law did not hold. There was a very remarkable thing in connection with that casting. The sulphur was down to .035, which was extraordinarily low for light castings. Whether that was the changed condition that produced the result or not I do not know, and that is not the point I want to raise to-night. I mention it to show how necessary is a comprehensive study of the elements in cast iron. I trust that the result from the reading of this paper will be that this association will take hold of this work and stick to it until we do know something positive about the relations of the metalloids in cast iron.

Mr. Sorge: I feel that it is due to Maj. McDowell to make the explanation that he has stated to me that he hopes the Western Foundrymen's Association will take hold of this matter, but that he intends to go ahead with it himself, if the association does not. I think that it is a very laudable ambition on his part, but I think he will have an awful job to do it alone.

Maj. McDowell: This has been a subject that I have given a good deal of study, to ascertain what the state of the art

was in this country as well as in the rest of the world, to see if I could not learn what had been done, so that if possible I could get hold of some place where others had left off. I here give a table showing eight heats that were made in England in a hot air furnace, and two made by myself at home in a cupola:

Number of heat.....	1	2	3	4	5	6	7	8	9	10
Total Carbon.....	1.98	2.00	2.69	2.21	2.18	1.98	2.23	2.01	2.71	3.12
Uncombined Carb'n	0.38	0.10	0.24	0.50	1.62	1.19	1.43	1.31	1.62	2.19
Combined Carbon...	1.62	1.90	1.85	1.71	0.56	0.68	0.80	0.20	1.09	0.93
Silicon	0.19	0.45	0.96	1.37	1.96	2.25	2.96	3.92	0.94	1.34
Manganese.....	0.14	0.21	0.26	0.00	0.60	0.75	0.70	0.84	0.60	1.25
Tensile strength per square inch...	22 000	27,000	28,000	31,000					32,000	49,000

Eight of the ten different heats given in the foregoing table were taken from Howe's "Metallurgy of Steel," the other two heats I made. The first eight were evidently made in a hot air furnace, while the last two were made in a cupola. Howe says in reference to the eight heats: "As silicon rises beyond 1 4-10 the percentage of graphite at first increases rapidly, then falls off slowly, while tensile and compressive strength both decline uninterruptedly, while experience shows that no one set of observations on the effect of foreign elements on iron is conclusive. Turner's results are so harmonious as to inspire confidence."The experiments of Mr. Thomas Turner here referred to are extremely interesting but are not satisfactory, because they treat of iron made in a hot air furnace and their results do not reach the quality of iron made in a cupola. As the general foundry practice in this country is with a cupola, what we want is the value of the different metalloids in combination with iron and carbon in making castings from metals melted in a cupola. The quality of our iron castings depends on the amount of carbon there is in them and its relations to the iron whether combined or uncombined. The two metalloids most seriously affecting these relations are manganese and silicon, the former intensifying the affinity iron has for carbon, while the latter under certain conditions eliminates and uncombines the carbon. Iron's capacity for absorbing carbon alone is limited to about 4.50 per cent, but when manganese is present in sufficient quantities it will carry from 6.50 to 7.50 per cent and when chromium is substituted for manganese it will carry from 10 to 12 per cent in combination. Iron has a greater affinity for silicon at certain temperatures than it has for carbon and will absorb it to carbon's exclusion, so that silicon pig carrying from 8 to 10 per cent silicon has less than two per cent carbon. Where iron is low in carbon, say less than 2.5 per cent and silicon 1.25 per cent or less, the carbon will remain combined, but when the combined amounts of carbon and silicon are over four per cent graphite carbon is formed. No one knows the true value of the metalloids in iron. I have succeeded in making some first-class metal. I would not lie to tell you what the mixture was for the next time it was tried it might not do it. Therefore I had decided to go ahead with a series of experiments, feeling sure that there are a large number of institutions in this counrty that would be only too glad to take up a part of this work. I came to the Western Foundrymen's Association feeling this. It is one of the bright things in the world to know that there is an association of men, who, like myself, are making iron. If we can form a combination of individuals out of this association to carry on these experiments it will be of very great value to the entire foundry industry.

Mr. Sorge moved that a commmitee of three be appointed by the chair to carry on a series of tests and experiments to determine the practical value of the metalloids in cast iron, and to carry on this work under the direction of the board of directors of the Western Foundrymen's Association. The motion was duly seconded by Mr. Pettigrew and passed by the association.

The president appointed the following as members of this committe: A. Sorge, Jr., Maj. Malcolm McDowell, and John K. Mackenzie.

A vote of thanks was tendered Maj. McDowell for his paper. A vote of thanks was also tendered Messrs. Dickman and Mackenzie for offering their services in the work. The meeting then adjourned.

After an idleness of two months the Saltsburg, Pa., rolling mill has resumed giving employment to 250 men. P. H. Laufman & Co., Pittsburg, control the plant.

THE PRACTICAL VALUE OF THE VARIOUS METALLOIDS IN CAST IRON.*

BY MAJ. MALCOLM MCDOWELL.

The iron master of to-day, manipulating the modern blast furnace and improved paraphernalia, backed up by the scientific knowledge of his chemist, sees in the immense piles of ores that lie in his yard great possibilities. The chemist begins the development of the ore. When the constituents and value of each kind of ore have been determined, the furnaceman uses the information in making up the different charges to produce a certain specified grade of metal. An error on the part of the chemist or a mistake made by the furnaceman in combining the ores and their fluxes, or a failure to supply enough fuel or admit the air at a proper temperature would cause a failure in producing the grade of metal specified. While a scientific knowledge is essential, a practical application of the same is necessary, which is true not only for the blast furnace, but also in remelting the product in the cupola.

A large number of blast furnaces are run especially to turn out metal for steel-makers according to specifications laid down by the steel-maker's chemist who knows what grade of metal is necessary for his purpose. A few thousandths of one per cent more or less of certain metalloids will condemn the metal for making steel, but a percentage of phosphorus that would injure it for steel would not be objectionable in gray iron castings. So the grade of metal with this objectionable feature is called "off" or No. 2 Bessemer, and the foundrymen buy it for special castings. There are a few blast furnaces well located with reference to ores and fuel whose managers have taken the trouble to carefully and scientifically investigate the requirements of certain consumers and are meeting successfully their demands, sending out with each car of pig iron an analysis of the metal.

This method is proving satisfactory to both parties, for the foundryman, knowing what he gets, uses it intelligently and he can well afford to pay a premium for such metal. This will compensate the furnaceman for the extra cost of analyzing each carload shipped, especially as it relieves him of further responsibility. Northern blast furnaces running especially on foundry pig buy their ores where they can get them the cheapest. They are termed Lake Superior ores and for this reason much is claimed for the metal they make but only to a limited extent are these claims justified.

Southern blast furnaces that are favorably located with reference to fuel and ores are limited to local supplies and for this reason whatever grades of metal they make show more uniformity than in Northern furnaces.

Each section grades its output by fracture, and numbers it from one to six, or from one to three, grading the remainder into forge, mottled or white.

The corresponding numbers of pigs from the Northern and Southern sections do not at all agree as to fracture, neither is there a reliable similarity in the corresponding numbers of furnaces in either sections.

It is possible for a furnace that uniformly runs on the same ores and fuel, to establish grades and numbers by making first a standard and establishing it by repeated chemical analyses. The granular formation is subject to changes caused by the different temperatures at which the metal is cast, but these variations, which are the exceptions, can be noted, and runs of this sort kept out of the general output.

There is either ignorance, indifference or carelessness in grading pig iron and shipping the same on orders based on claims made by sales agents as to the analysis of the metal made.

In addition to the different numbers and grades, there has been added another variation which is designated by letters added to numbers, as "No. 2P" or "No. 2X," the full significance of which is known by the sales agent only. One of the most unsatisfactory things connected with buying metal by analysis is the card issued, giving the analysis of certain brands by numbers, which usually does not correspond in the least with the iron delivered.

The great tonnage of pig iron is handled in the market by agencies. Some of these are directly connected with, or owners of blast furnaces and it is their business to sell the

*Read at the me ting of the Western Foundrymen's Association, Chicago, July 15, 1896.

output. In many cases they make the price, but more frequently it is made by the management of the furnaces which is often influenced by its necessities as well as by the fair legitimate competition of its neighbors.

In the offices of the different agencies are young men who are the sales agents on the road, representing the different furnaces. They are men with an honest, intelligent appearance and have an easy and agreeable address, with a fund of general information on all subjects, including statistics of iron

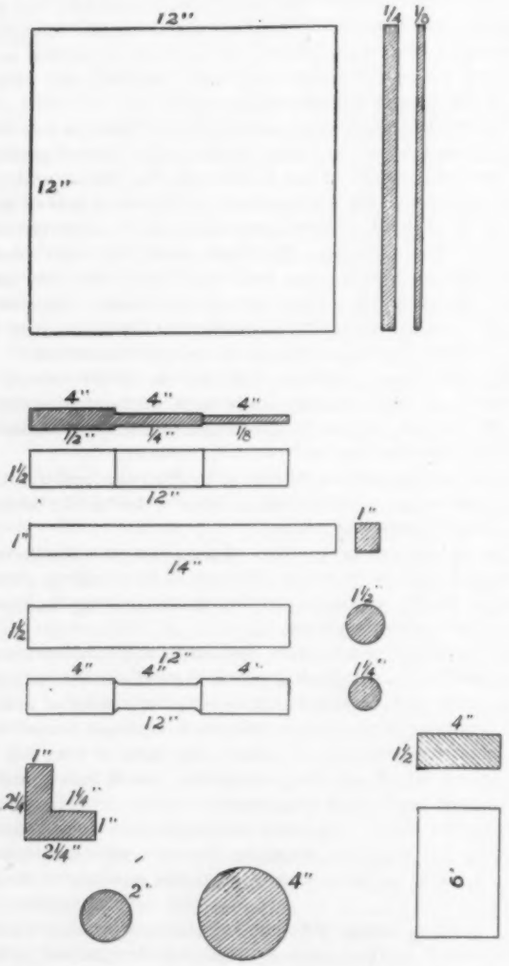
TABLE No. 1.

MATERIAL TO BE USED IN MAKING EXPERIMENTS WITH CHARCOAL AS FUEL.

	Carb.	Sili.	Phos.	Mang.	Sul.
1. Swedish Charcoal Wrought Iron..... ...	.17	.05	.08	.00	.003
2. Low Carbon Steel Scrap	.15	.005	.05	.65	.005
3. Ferro-Manganese, 80 per cent Mang.....	6.50	.30	.20	80.	.00
4. Ferro-Silicon, 10 per cent Sil..	3.	10.	.41	1..0	.002
5. Ferro-Phosphorus or Ætna Basic Pig..	3.25	.75	2.2	.00	.00

PATTERNS TO BE USED FOR TEST BARS AND PIECES.

1. For flui'ity in casting and
2. Toughness when annealed.
3. 1" □ bar for transverse and torsion strength.
4. For tensile, turning 1½" bar to 1" area.
5. For tensile, just as it was cast.
6. Angle bar, to test solidity and segregation.
7. Chill block cast with edge against ch·ll 6" x ¼" x 1½".
8. For mach ning and turning 4" x 2" x 24".



made and sold in the world, especially in the United States, and more particularly by their firm. They have no scientific or practical knowledge of the making or using of iron. They don't need it. The foundryman has that, and they have the iron to sell, which has a reputation regarding which they are thoroughly posted. Among the many engaged as salesmen are some old veterans that have from experience formulated a "special mix" which usually consists of a variety of brands that they have for sale, in the make up of which is always a generous amount of "softener." This neutralizes any of the inequalities of the various "off" or unknown brands that are in the "mix." If this does not prove satisfactory to the foundryman, the sales agent reduces the amount of salable pig and adds instead more "softener." A salable pig will sell itself. It is the off or unknown brands which tax the salesmanship of the veteran but it is this man the foundryman is always glad to see. The latter knowing little of the value or influence of the different metalloids in the pig, or what to specify for his work, likes to divide the responsibility of his guesses with the sales agent, and the more he has guessing the larger number there are between whom to divide the responsibility of failure.

Both men see the practical value of a "neutral pig" or "softener," but while it gives a metal that can easily be machined it often becomes spongy and weak just where it should not be, and thus there are constant failures in trying to produce a sound, solid, homogeneous casting that can be easily machined and has a fair measure of strength. The metal fails for the want of some other ingredient to counteract the effect produced by too much "softener."

A "softener" is not a "cure all" for all ills that metal is heir to.

The furnaceman and the foundryman are alike interested in knowing the value of each constituent element composing the pig that is made by one and used by the other, not so much a scientific expression of their value, but a practical demonstration that will enable the one to formulate a specification of his wants that the other may meet the requirements with as much ease and precision as he does the wants of the chemist of the steel-maker.

As a general thing, the foundryman does not know the chemical constituents of a metal that will make a casting for a special purpose. He buys a metal from the furnaceman that the one thinks and the other hopes will make what they want, neither are certain—both are guessing—each holding the other responsible if it fails, both claiming the honor if it succeeds.

There is quite as much anxiety among furnacemen as among foundrymen to know whether there is going to be any fault finding when castings are made of a lot of pig iron guaranteed to do a certain work. Out of all this anxiety from "guessing" is evolving a new condition. Here and there foundrymen are adding laboratories to their equipment and the chemists are learning the value of certain metalloids in making special castings. The furnaceman is expressing a willingness to meet the requirements of the foundryman when he knows what it is he wants.

Furnacemen will learn for what kind of business their natural output is best adapted, and will turn their attention to some special grade and so perfect it, thus their natural advantages will give them the preference and quality will be quite as much considered as quantity.

Assuming the furnaceman is ready to fill specifications for grades of pig iron that will meet the requirements of the foundryman for his special work, it is then of great importance that the foundryman should know the value of the metalloids that combine with iron, and what should be their proportions to produce a certain grade or kind of casting.

There is, more or less, information scientifically expressed of the nature and relations existing between iron and carbon and the various influences exerted on them by the four different metalloids—silicon, phosphorus, manganese and sulphur. This information is not put in such a practical form as to designate the value of these elements in making up a specification for certain grades of metal.

We know in a general way that silicon in certain proportions does hold carbon in combination and in other proportions uncombines, and eliminates it—that it gives fluidity to molten metal—to a limited extent prevents blow-holes, but under other circumstances promotes segregation and sponginess. It reduces a tendency to shrink or chill and alone does not make a strong casting but is one of the most important metalloids that is combined with iron and carbon.

Manganese is equally as important as silicon, though almost directly opposite to it. It intensifies the affinity iron has for carbon, and when melted in its presence picks it up and combines it with the iron. It increases a tendency to shrinkage and chill, closes up the grain and makes it a stronger metal, frees it from blow and pin holes, prevents segregation and sponginess, but makes the metal hard and cold, short or brittle.

These two metalloids influence the relation between iron and carbon in the opposite direction, and neither by itself make a desirable casting, but combined in their proper proportions they will give the best metal for a majority of work. Sulphur has little in it to recommend it to the favorable consideration of the foundryman. By some it is claimed to be a desirable ingredient in making a chill. It merely makes iron white, and does not improve the chill, only increases its weakness. It is estimated that one atom of sulphur neutralizes ten of silicon, and when manganese is low the metal is divided into gray and white iron assuming some very queer forms of distinct separation. When the manganese is sufficiently high these distinct lines of separation are broken up and the fracture shows a mottled bright gray or white, and the metal is hard, brittle and weak.

A few thousandths of one per cent of phosphorus will render metal unsuitable for steel making, but will not be objectionable in castings; on the contrary is desirable for most work where fullness and fineness of casting is required, and as its tendency is to reduce shrinkage, it would gain strength by an increase of heat, a very desirable characteristic for many purposes.

In Howe's "Metallurgy of Steel," will be found the latest compiled information on the relation of these metalloids when in combination with iron, but there is nothing in that valuable work that gives the foundryman the value of these metalloids so that he may make up a specification for the furnaceman.

The majority of the foundry pig iron made is used in foundries making specialties where the same mold is duplicated, requiring the same metal, day after day and year after year. The conditions are uniform and a metal to meet them is no more difficult to obtain than one to meet those requirements exacted by the steel-maker.

The difference between the foundryman and the steel-maker lies in that the latter knows the combinations and limitations of the different metalloids he wants, and the former does not, but when he does he will find plenty of furnaces well located for making his required grade of metal.

It is true, a blast furnace making foundry pig does not in each cast make one grade of metal only, but frequently makes all the numbers from one to six. Neither does the blast furnace running on metal for steel-makers; but the metal that would not meet the specifications would be the exception, and in each case this "off" grade metal from both kinds of furnaces would find sale in the large foundries where no special result is looked for, or in the job foundries whose chief reliance is in the cast scrap of the country to be carried by pig or a softener.

There are various grades of scrap cast iron which have been

TABLE No. 2.

FIRST HEAT CARBON AND IRON; SECOND, THIRD, FOURTH AND FIFTH HEATS, CARBON, SILICON AND IRON.

Kind of Material Charged in Cupola.	Weight of Metal Charged.	Metalloids in Metals.					Unannealed.			Annealed			Temperatures.			Temperature.	Nature of Metal.		Peculiarities of Fracture, Etc.
		Carbon.	Silicon.	Phosphorus.	Manganese.	Sulphur.	Tensile.	Transverse	Torsion	Tensile.	Transverse	Torsion.	Tensile.	Transverse.	Torsion.		Chill.	Shrink.	
FIRST HEAT.																			
Swedish Wro't Iron	250	.17	.05	.08	.00	.003													
Analysis of Casting																			
SECOND HEAT.																			
Swedish Wro't Iron	237½	.17	.05	.08	.00	.003													
Ferro Sil. 10 %	12½	2.	10.	.20	1.20	.002													
Estimated Analysis			.50																
Analysis of Casting																			
THIRD HEAT.																			
Swedish Wro't Iron	225	.17	.05	.08	.00	003													
Ferro-Sil. 10 %	25	2.	10.	.20	1.20	.002													
Estimated Analysis			1.00																
Analysis of Casting																			
FOURTH HEAT.																			
Swedish Wro't Iron	212½	.17	.05	.08	.00	.003													
Ferro-Sil. 10%	37½	2.	10.	.20	1.20	.002													
Estimated Analysis			1.50																
Analysis of Casting																			
FIFTH HEAT.																			
Swedish Wro't Iron	200	.17	.05	08	.00	.003													
Ferro-Sil. 10 %	50	2.	10	.20	1.20	.0 2													
Estimated Analysis			2.00																
Analysis of Casting																			

TABLE No. 3.

SIXTH, SEVENTH, EIGHTH AND NINTH HEATS, CARBON, MANGANESE AND IRON.

Kinds of Metal Charged in Cupola.	Weight of Metal Charged.	Metalloids in Metals.					Unannealed.			Annealed.			Temperatures.			Degree of Heat.	Nature of Metal.		Peculiarities of Fracture, etc.
		Carbon.	Silicon.	Phosphorus.	Manganese.	Sulphur.	Tensile.	Transverse.	Torsion.	Tensile.	Transverse.	Torsion.	Tensile.	Transverse.	Torsion.		Chill.	Shrink.	
SIXTH HEAT.																			
Swedish Wrought Iron	250	.17	.05	.08	.00	.003													
Ferro-Mang. 80 %	1.56¼	6.50	.30	.0	80.	.00													
Estimated Analysis					.50														
Anal. of Casting																			
SEVENTH HEAT.																			
Swedish Wrought Iron	250	.17	.05	.08	.00	.003													
Ferro-Mang. 80 %	3.12½	6.50	.30	.20	8 .	.00													
Estimated Analysis					1.00														
Anal. of Casting																			
EIGHTH HEAT.																			
Swedish Wrought Iron	250	.17	.05	.08	.00	.003													
Ferro-Mang. 80 %	4.78	6.50	.30	.20	80.	.00													
Estimated Analysis					1.00														
Anal. of Casting																			
NINTH HEAT.																			
Swedish Wrought Iron	250	.17	.05	.08	.00	.003													
Ferro-Mang. 80 %	6.25	6.50	.30	.20	80.	.00													
Estimated Analysis					2.00														
Anal. of Casting																			

melted and remelted until they are depleted of all the desirable metalloids and have picked up all the undesirable ones. Much of this is tolerated because it is cheaper than pig iron. Still the iron in the scrap is equally as good as the iron in the pig metal and all it requires is to be revived and any kind of casting can be made out of scrap that it is possible to produce from the best grades of pig iron, providing the foundryman knows the practical value of the different metalloids.

Nearly every foundryman has at times made an exceptional metal, but how he did it he does not know, nor has he ever since been able to reproduce it. Others have by experimenting with different brands of pig iron, produced an exceptional metal, and as long as they were sure of the same pig they duplicated it. But what special metalloids acted in combination with the iron they were unable to tell, and are no better off than the Ordnance Department of the United States Army is to-day as to what metalloid there is in "gun metal" that makes it what it is.

Back in the 'Fifties the United States Government made an appropriation for the Ordnance Department to experiment with reference to making a metal for cannon. Captain Rodman was detailed to do this and in July, 1856, he made the first heat. Preliminary heats were made to find the best pig metal to use in their mixture. They tried most all of the brands of charcoal pig then made, and selected a combination of "Greenwood" and "Salisbury" which were charged in the hot-air furnace, melted and cast into a pig and this pig was again melted and cast into the gun. In their first heat the metal remained in the furnace over five hours, becoming, as Captain Rodman says, decarbonized and the test bar showed a tensile strength of from 38,000 lbs. to 40,000 lbs., but was cold-short and brittle and was condemned. Subsequent heats brought the tensile strength below 36,000 lbs and 33,000 lbs., which proved satisfactory as the metal showed more elasticity.

The pig used was cold blast charcoal, the chemical analysis of which was not given nor was there analysis of the resultant heats, but there was a marked difference shown by the physical tests.

Captain Rodman claimed the "cold-short" heat of high tensile strength was decarbonized but what the carbon or any of the other constituents were in the metal, is not recorded, nor is there any record of a chemical analysis of the metal at

TABLE No. 4.

TENTH, ELEVENTH, TWELFTH AND THIRTEENTH HEATS.—COMBINATIONS OF CARBON, SILICON, MANGANESE AND IRON. PER CENT OF SILICON INCREASES, WHILE MANGANESE REMAINS STATIONARY.

Kinds of Metal Charged in Cupola.	Weight of Metal.	Metalloids in Metals.					Unannealed.			Annealed.			Temperature.			Temperature.	Nature of Metal.		Peculiarities of Fracture, Etc.
		Carbon	Silicon.	Phosphorus.	Manganese.	Sulphur.	Tensile.	Transverse.	Torsion.	Tensile.	Transverse.	Torsion.	Tensile.	Transverse.	Torsion.		Chill.	Shrink.	
TENTH HEAT.																			
Low Carbon Steel	225	.15	.005	.05	.65	.005													
Ferro Sil. 10 per cent	25	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	3.13	6.50	.3	.20	.80	.00													
Estimated Analysis			1.00		1.00														
Analysis of Casting																			
ELEVENTH HEAT.																			
Low Carbon Steel	212½	.15	.005	.05	.65	.005													
Ferro-S l. 10 per cent	37½	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	3.13	6.50	.30	.20	80.	.00													
Estimated Analysis			1.50		1.00														
Analysis of Casting																			
TWELFTH HEAT.																			
Low Carbon Steel	200	.15	.005	.05	.65	.005													
Ferro-Sil. 10 per cent	50	2.	10.	.20	1.20	.0 2													
Ferro-Mang. 80 per cent	3.13	6.50	.30	.20	80.	.00													
Estimated Analysis			2.00		1.00														
Analysis of Casting																			
THIRTEENTH HEAT.																			
Low Carbon Steel	175	.15	.005	.05	.65	.005													
Ferro-Sil. 10 per cent	75	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	3.13	6.50	.30	.20	80.	.00													
Estimated Analysis			2.50		1.00														
Analysis of Casting																			

TABLE No. 5.

IN FOURTEENTH AND FIFTEENTH HEATS, SILICON DECREASES, MANGANESE STATIONARY; SIXTEENTH AND SEVENTEENTH HEATS, MANGANESE INCREASES, SILICON STATIONARY.

Kinds of Metal Charged in Cupola.	Weight of Metal Charged.	Metalloids in Metals.					Unannealed.			Annealed.			Temperatures.			Temperature.	Nature of Metal.		Peculiarities of Fracture, etc.
		Carbon.	Silicon.	Phosphorus.	Manganese.	Sulphur.	Tensile.	Transverse.	Torsion.	Tensile.	Transverse.	Torsion.	Tensile.	Transverse.	Torsion.		Chill.	Shrink.	
FOURTEENTH HEAT.																			
Low Carbon Steel	231¼	.15	.005	.05	.65	.005													
Ferro-Sil. 10 per cent	18¾	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	3.13	6.50	.30	.20	80.	.00													
Estimated Analysis			.75		1.00														
Analysis of Casting																			
FIFTEENTH HEAT.																			
Low Carbon Steel	237½	.15	.005	.05	.65	.005													
Ferro-Sil. 10 per cent	12½	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	3.13	6.50	.30	.20	80.	.00													
Estimated Analysis			.50		1.00														
Analysis of Casting																			
SIXTEENTH HEAT.																			
Low Carbon Steel	225	.15	.00	.05	.65	.005													
Ferro-Sil. 10 per cent	25	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	4.78	6.50	.30	.20	80.	.00													
Estimated Analysis			1.00		1.50														
Analysis of Casting																			
SEVENTEENTH HEAT.																			
Low Carbon Steel	225	.15	.005	.05	.65	.005													
Ferro-Sil. 10 per cent	25	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	6.25	6.50	.30	.20	80.	.00													
Estimated Analysis			1.00		2.00														
Analysis of Casting																			

any of the stages of these experiments. What it was or what it lacked chemically, that made one specimen test stronger than another, but cold-short, is not known.

If the United States Ordnance Department knows no more now than it did when "Rodman" formulated the specification for castings calling for "gun-metal," defined as charcoal pig metal melted in a hot-air furnace, they should be as interested in knowing the practical value of the metalloids that combine with iron in making special castings as the furnaceman or foundryman.

Failing to find records that give what is needed, and knowing from my own experience the great value of a knowledge of the relations which exist between different metalloids and iron in making castings, I think it would be advisable to make a series of experiments to determine these relations and their relative values.

I would use a cupola that would melt 1,000 lbs. an hour, taking 250 lbs. on the bed, tapping the latter amount into a ladle of that capacity from which I will take the tests necessary. Charcoal should be used as fuel until the desired metal is found, and then coke or anthracite coal used to determine their effect on the standard.

Table No. 1 gives the material to be used in the experiments: First is Swedish wrought iron, the lowest in all the metalloids that combine with iron. Second is low carbon steel which is also low in the metalloids excepting in manganese. Third is ferro-manganese carrying 80 per cent manganese. Fourth is ferro-silicon, carrying 10 per cent silicon. Fifth is ferro-phosphorus or Ætna basic pig. Also on table No. 1 is a list of patterns for test-bars and pieces for different test each heat having enough cast to submit the metal to all the chemical, physical and metallurgical tests.

In table No. 2, the first heat is simply "Swedish" wrought iron which will pick up enough carbon in the cupola to give the value of carbon and iron. Heats Nos. 2, 3, 4 and 5 are the same as No. 1, with additions of silicon, commencing in No. 2 with .50 silicon and increasing by degrees to No. 5 to 2.00 per cent silicon. This series will determine the value of silicon alone with carbon and iron.

In table No. 3, we substitute manganese for silicon, starting in heat No. 6 with .50 manganese, and increasing by degrees to heat No. 9, raising it to 2.00 per cent manganese. This series will determine the value of manganese alone with carbon and iron.

As silicon and manganese change their influence on the action of carbon and iron at different degrees of saturation, but in like proportion are opposite, there is a point where each change, which, when ascertained, will be the point where the best results will be obtained for a basis for variation of percentage of either of these two.

In commencing our series of heats to ascertain the best combination of these two metalloids, we will use the low carbon steel instead of Swedish iron and ferro-silicon and manganese.

In table No. 4, we commence in heat No. 10 with silicon and manganese, the same at 1.00 per cent, and in the subsequent heats Nos. 11, 12, and 13, we keep manganese at 1.00 per cent and increase the silicon in each heat .50 per cent, until we reach 2.50 silicon. This series will determine the value of silicon and manganese with carbon and iron with varying proportions of silicon.

In table No. 5, heats Nos. 14 and 15, the silicon is reduced to .75 and .50 per cent, the manganese remaining at 1.00 per cent. In heat Nos. 16 and 17 silicon remains at 1.00 per cent, and manganese is varied to 1.50 per cent and 2.00 per cent. These different variations will make themselves manifest in the tests.

In table No. 6, heat No. 18, we commence with silicon and manganese at 1.00 per cent and add 1.00 per cent phosphorus, and in heats Nos. 19, 20 and 21, the proportions of phosphorus are increased until we have 2.50 per cent. This will show us the influence phosphorus has carrying with it the same amount of silicon and manganese.

TABLE No. 6

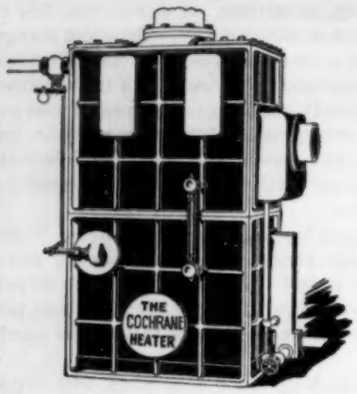
IN EIGHTEENTH, NINETEENTH, TWENTIETH AND TWENTY-FIRST PHOSPHORUS INCREASES, MANGANESE AND SILICON REMAIN STATIONARY.

Kind of Metal Charged in Cupola.	Weight of Metal.	Metalloids in Metals.					Unannealed			Annealed.			Temperatures.			Temperature.	Nature of Metal.		Peculiarities of Fracture, Etc.
		Carbon.	Silicon.	Phos-phoros.	Man-ganese.	Sulphur.	Tensile.	Trans-verse.	Torsion.	Tensile.	Trans verse.	Trosion.	Tensile.	Trans-verse.	Torsion.		Chill.	Shrink.	
EIGHTEENTH HEAT.																			
Low Carbon Steel	225	.15	.005	.05	.65	.005													
Ferro-Sil. 10 per cent	25	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	3.13	6.50	.30	.20	80.	.03													
Phosphorus	2½			2.50															
Estimated Analysis			1.00	1.00	1.00														
Analysis of Casting																			
NINETEENTH HEAT.																			
Low Carbon Steel	225	.15	.005	.05	.65	.005													
Ferro-Sil. 10 per cent	25	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	3.13	6.50	.30	.20	80.00	.00													
Phosphorus	3.75			3.75															
Estimated Analysis			1.00	1.50	1.00														
Analysis of Casting																			
TWENTIETH HEAT.																			
Low Carbon Steel	225	.15	.005	.05	.65	.005													
Ferro-Sil. 10 per cent	25	2.00	10.	.20	1.20	.002													
Ferr-Mang. 80 per cent	3.13	6.50	.30	.20	80.	.00													
Phosphorus	5.00			5.00															
Estimated Analysis			1.00	2.00	1.00														
Analysis of Casting																			
TWENTY-FIRST HEAT.																			
Low Carbon Steel	225	.15	.105	.05	.65	.005													
Ferro-Sil. 10 per cent	25	2.00	10.	.20	1.20	.002													
Ferro-Mang. 80 per cent	3.13	6.50	.30	.25	80.	.00													
Phosphorus	6.25			6.50															
Estimated Analysis			1.00	2.50	1.00														
Analysis of Casting																			

These experiments in connection with phosphorus can be made to an advantage by changing the percentage of the other metalloids to ascertain with which it exerts the best influence.

As the material charged into the cupola is analyzed, and each heat has an estimated analysis, of the total amount of each ingredient present, and as the castings from these heats are analyzed and placed in their place on the tables, it will be clearly shown the loss or gain in the cupola and which special metalloid or combination of them produce peculiar effects. We will also have clearly demonstrated by our table the effects of the metalloids and their combinations upon the physical, chemical, and metallurgical tests, determining the practical value of each or a combination of the metalloids in making cast iron in a cupola.

A PARTY that included Nikola Tesla, the electrician, and Chief Engineer Melville, of the U. S. Navy, were guests of George Westinghouse, Jr., last Saturday and inspected the Westinghouse plant and various steel mills at Pittsburg. The primary object of the visit was to see the working of the Tesla motor at the Westinghouse Electric & Mfg. Co.'s works. After a tour around Pittsburg the party left for Niagara Falls to note the working of the Tesla motors now used by the Cataract Construction Co.



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Put some of your capital in a good feed-water heater.

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IS A DIVIDEND EARNER,

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Manufacturers of
THE COCHRANE HEATERS.
THE COCHRANE SEPARATORS.
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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, ple se notify *The Iron Trade Review* and we will put you in communication with our advertis rs at once.]

Th Anti-Chill Core Compound Co., has been incorporated at Peoria, Ill., with a capital stock of $2,500, to manufactrue castings, metal cores, etc., by Geo. M. Spangler, Chas. E. Anderson and Wm. P. Roberts.

The Terre Haute Mfg. Co., has been incorporated at Terre Haute, Ind., with a capital stock of $35 000 to manufacture bicycles and sewing machines. The incorporators are: W. R. McKeen, N. K. Elliott and E. H. Birdley.

The Mecklenburg Iron Works, Charlotte, N. C., will buy a 12-foot pulley, second-hand, 12, 14 or 16-inch face, which can be fitted to 5 1-2 inch shaft, or a 12-foot balance wheel, 12 or 14-inch face.

G. W. Cross, 610 13th street, N. W. Washington, D. C., wants to buy a second-hand No. 20 "A" Penfield brick machine. He also desires circulars and price lists of other brick making machinery, or equipment that usually enter a brick yard.

New Construction :—

The Block-Pollock Iron Co., of Cincinnati, will build a forge shop at its works at Carthage, near Cincinnati. The main building will be 80x350 and the construction will be entirely of steel.

The Andrews & Hitchcock Co., of Hubbard, O., has purchased two mammoth blowing engines and is now building an engine house. It has also purchased separators of Jas. Bonan & Co., of Pittsburg.

The Southern Railway Co. will erect at Greenville, Miss., a complete river tipple similar to those now in use on the Monongahela river, except that two weigh baskets will be used instead of one, the idea being to utilize the additional basket as a counter weight. The work will be done by the Phillips Mine Supply Co., of Pittsburg.

C. W. Taylor, New Cumberland, Pa., will build a machine shop.

The Gas Engine & Power Co., Morris Heights, N. Y., has plans for a new two story machine shop, 250x76 feet, to be built of steel.

The contract for the steel superstructure of the new plant of the Slaymaker-Barry Co., at Connellsville, Pa. has been let to the Maryland Steel Co., Sparrows Point, Md.

A smelting furnace for the reduction of brass, copper and other high grade metals is to be erected near Connellsville, Pa. Two buildings, 40x100 each will be built and possibly two more of the same dimensions.

It is announced that a new tin plate mill will be built at Washington, Pa., by capitalists from Cumberland, Md.

The Penn Bridge Co., of New Brighton, Pa., has been awarded the contract for the buildings of H. A. Lozier & Co., to be erected at Greenville, Pa.

The Tyler Tube & Pipe Co., of Washington Pa., has been awarded the contract by the Government for the charcoal iron boiler tubes for a number of war vessels. The contract, which is for 30,000 tubes, must be filled in 60 days.

The Shoen Pressed Steel Co., Pittsburg, are building a steel structure 90x400 feet. It will be equipped with hydraulic cranes.

Additions, Enlargements, Removals, Etc. :—

The Pope Mfg. Co. is breaking ground for another factory building at Hartford, Conn. It will be 75x252 feet structure and in harmony with the office building, which will adjoin it. It will be three stories high with a basement.

The Berger Mfg. Co., Canton, O., is completing a new building 20x60 feet, in which to manufacture the Gerber patent lock joint steel tubing for bicycles.

Humphrey & Sons, Joliet, Ill., are building a large addition to their foundry. It will contain six pneumatic cranes.

Fires and Accidents :—

The plant of the Covel Machine Co., Fall River, Mass., was damaged $5,000 by fire recently.

The Humber Bicycle Works, at Coventry, Eng., burned last week with $400,000 loss.

At Chicago, the car barn of the Chicago City Railway Co., 150x400 feet, burned July 18, with 554 cars. The loss is $500,000.

General Industrial Notes :—

The Braddock Wire Works resumed in part on Monday morning.

The plants of A. M. Byers & Co., Pittsburg and Lindsay & McCutcheon, Allegheny, resumed on Monday.

The Alice Furnace at Sharpsville, Pa., blew out last Friday after a two year's run. Extensive repairs will be made.

A large body of short fiber asbestos was discovered some time ago in White County, Ga, The asbestos rock in this body is about 350 feet wide, 950 feet long, and as far as known, 60 feet deep. The material in the rock is not adapted for textile fabrics, but is especially valuable for paper pulps, cement and for bricks for lining furnaces, heaters, and grates. The bricks can be cut directly from the rocks. For other purposes the rock needs only to be milled, no separation being necessary on account of its almost absolute purity. The analysis of the rock shows about 50 per cent silica and 30 per cent magnesia.

The deposit is owned by the Sall Mountain Asbestos Co., of Sautee, White County, Ga. The company manufactures the asbestos into lagging for locomotives, coverings for boilers and steam pipes, insulating materials for refrigerators and cold storage cars, coaches and sleeping cars and material for deafening floors. It is also made into material for fire proofing and insulating partitions. The sales agency of the Sall Mountain Asbestos Co. is in the hands of Bruner, Sprague & Co., 1027 Manhattan bldg., Chicago. Further information regarding this product can be obtained from the sales agency.

Six of the 12 vertical compound condensing blowing engines, for which the Carnegie Steel Co., Ltd., gave an order to the

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UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

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The "CLEVELAND" is the Best UNDERFEED Furnace.
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THE AMERICAN FIRE BRICK & CLAY CO., Mineral Point, Ohio.

HIGH GRADE FIRE BRICK for

Rolling Mills, Steel Works, Blast Furnaces, Cupola Linings, Boiler Settings.

—All Shapes in Stock—

Our large capacity, 8,000,000 annually, and modern plant, enable us to handle contracts of any size promptly.

Ground or Calcined Clay in Sacks or Bulk.

"THE IRON TRADE REVIEW"

is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

Edward P. Allis Co., Milwaukee, are now in service and their work has exceeded all expectations. The Milwaukee works are about to ship a pumping engine to Sacramento, Cal., and are beginning work on the large pumping engine recently ordered for the City of Cleveland. Among other orders received are two cross compound engines of 1,000 h. p. each direct coupled to electric generators for the Syracuse Street Railway Co., Syracuse, N. Y.; one engine of 800 h. p. for the Brocton Srteet Railway, Brocton, Mass.; large hoist for Butte, Mont.; four large engines for the Otis Falls Pulp Co., Maine; cross compound condensing engine for the McCormick Harvester Machine Co., Chicago; tandem compound engine for the Sandusky Electric Light Co., Sandusky, O. The engine department of the works has well in hand the order recently received from the Northwestern Elevated Railway Co., of Chicago for 9,000 h. p. of engines, and has just shipped a vertical compound condensing engine of 2,500 nominal h. p. to the Warren Mfg. Co., Warren, R. I. A twin tandem compound condensing engine of 2,500 h. p. has just been started in the new Berkshire Cotton Mfg. Co. mill, Adams, Mass. The company has also just started the first of the six large pumping engines which it is building for the city of Pittsburg. It is shipping to the Canal & Claiborne St. Ry. C., New Orleans, two tandem compound condensing direct coupled engines of 700 h. p. each. In the mining department, an order has just been received for the complete machinery of a large new reduction works to be built in Colorado. This includes the engine, boilers, crushers, rolls, concentrators, clorination barrels, etc. —the entire machinery of the plant. The saw mill department has just had an order for the complete machinery of a large mill to go to California, which will be one of the largest sawmills in the country. It includes in addition to sawmill machinery, the necessary engines and boilers.

The J. H. McEwen Mfg. Co., 18 Dey st., New York, report the following sales for the month of June: Dynamos—60 k. w. belted and 100 k. w. direct connected to 16x16 McEwen engine, to Jeffrey Mfg. Co., Columbus, O.; 50 k. w. and 100 k. w. direct connected to 12x12 and 15x16 McEwen engines, to Bissell, Dodge & Erner Co., Toledo, O.; 100 k. w. and 150 k. w. belted machines, to Link Belt Machinery Co., Chicago; 30 k. w. belted, to Jeffrey Mfg. Co., Columbus, O.; 25 k. w. belted, to New York Safety Insulated Wire Co., New York; 200 k. w. d. c. to McEwen tandem compound engines and 400 k. w. d. c. to McEwen tandem compound engines, to Tacony & Frankford Electric Ry. Co., Tacony, Pa.; (this is the second order by this company, the first having been for two

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Have a Special Lot of Second-Hand Tools. All in First-Class Condition.

1—55″ Allen Riveter.
1—24x24x7 ft. New Haven Planer.
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
1—16x18″ Lathe & Morse Crank Planer.
2—15″ Hendey Shapers.
1—15″ Youngson Shaper.
1—15″ Smith and Mills Shaper.
1—10″x5′ Prentice Engine Lathe.
1 each 14″ and 15″x6′ Ames Engine Lathe.
1—16x5 ft. Bullard Engine Lathe.
1—18x8 ft. L. W. Pond Engine Lathe.
1—24x8 ft. Phillips Engine Lathe.
1—24x14 ft. Lathe & Morse Engine Lathe.
1—38x14 ft. New Haven Engine Lathe.

AND MANY OTHERS.

We have all the best makes of New Tools. Send for Second-Hand List.

THE ONLY SUCCESSFUL **CORE..... COMPOUND**

JELOLUSE

A Fine Powder.
Disintegrates!
Don't Blow!
Saves Fuel!

It can be used with Black or Gangway Sand and is

Used by a large number of the best known Foundries Exclusively——

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of Mechanics, Electricity, Architecture, Mining, Plumbing, Heating and Ventilation, Steam Engineering, Civil Engineering and Mechanical and Architectural Drawing.

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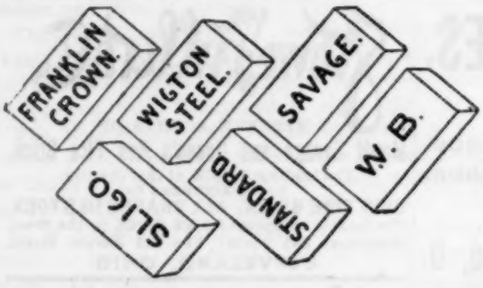

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MANUFACTURERS OF AND DEALERS IN

All Kinds of Pipe, Globe and Gate Valves, Fittings and Appliances for Steam, Gas, Water and Hydraulic Work.

Phosphor Bronze ("Elephant Brand") Castings, Coolers, Tuyeres and Cinder Notches for Blast Furnaces supplied promptly.

Rolling Mills, Steel Works, Blast Furnaces Coal and Coke Works, Power Houses for Electric Street Railways, etc., promptly fitted up by Experienced Workmen.

AIKEN Duplex and CRITCHLOW Valves, either three or four way, for operating Mill and Hydraulic Machinery of all kinds under any desired pressure, and Stop Valves for same.

Agents for the CAMERON STEAM PUMP, which is made in every possible variety, and suitable for all purposes to which Steam Pumps can be applied.

Nos. 108 to 118 Third Avenue, PITTSBURGH, PA.

W. G. & G. Greenfield, of the Greenfield Steam Engine Works, East Newark, N. J., are building a wire loom to weave 112 inches of wire cloth, for Alfred Workman, late of the firm of Lewis & Workman, of Harrison, N. J. The same makers built a previous loom, considered by experts to be of superior design and efficiency.

200 k. w. direct connected generators to McEwen tandem compound engines.) Engines—9x10, to W. M. Johnston & Co., Chicago; 8x10, to Elk Tanning Co., Philadelphia; 13x14, to Jeffrey Mfg. Co., Columbus, O.; 13x14, to Scranton Electric Construction Co., Scranton, Pa.; 8x10, to Jeffrey Mfg. Co., Columbus, O.

The new highway bridge across the Connecticut river connecting Middletown with Portland, Conn. is now swung by electricity. The electrical equipment consists of four General Electric 800 motors. Two of these are connected with the swinging mechanism one working and the other being held in reserve. Of the other two, one is located under each end of the turning span, to raise it from the fixed piers before the third motor begins to swing it. The bridge span is 450 feet long—the longest single span highway bridge in the world. Previous to the installation of this electrical equipment by the General Electric Co., 15 men were required to start the bridge and eight men to swing it.

It is stated by the company that the report that the John Dunlap Co., of Pittsburg, manufacturers of stamped and japanned ware, recently bought a large site of ground near Homestead, Pa., and would erect a large plant on it, is without foundation.

Watts Furnace, at Middleboro, Ky., banked last week. Two hundred men are thrown out of employment.

The contract for the cell work for the new Cook county jail at Chicago, which was recently given by the county commissioners to the Van Dorn Iron Works Co., of Cleveland, has

been set aside by the court, and the contract is ordered given to the Champion Iron Co., of Kenton, O., the lowest bidders at $50,229. Further litigation is promised.

The Rarig Engineering Co., of Columbus, O., manufacturer of Corliss engines, blast furnace and rolling mill machinery, has secured quarters in Pittsburg, and will shortly open offices, discontinuing its offices in the East.

The Addyston Iron, Steel & Pipe Works, at Cincinnati, is in operation. For several months it has been practically idle.

F. R. Dravo & Co., of Pittsburg, have received an order from the National Tube Works Co., of McKeesport, for two additional 10-inch Cochrane separators. This makes the fourth order placed within a year for these goods and making a total of 14 now in use.

The Murray Iron Works, of Burlington, Ia., and the Sioux City Engine & Iron Works, of Sioux City, Ia., have recently made an arrangement whereby the Murray Iron Works Co. will build the Sioux City Corliss engine for the territory of the United States east of DesMoines, and the business west of there will be handled as heretefore by the Sioux City Engine & Iron Works. New shops are about completed at Burlington and are being equipped with modern machinery.

The puddlers employed at the National Rolling Mill, McKeesport, Pa., have asked for the $4.50 puddling rate provided in the new scale. The company has paid the scale rate heretofore.

The rod mill and wire drawing departments of the Pittsburg Wire Co.'s plant at Braddock, Pa , started up Monday.

At Anderson, Ind., the National Tin Plate Co. has resumed with two mills.

Sandusky and Lorain, O., have been negotiating with the Born Steel Range & Mfg. Co., of Galion, O., in connection with the latter's plan to build a second factory at a lake port.

A cargo of 3,000 tons of iron ore from Conception Bay, Belle Isle, Newfoundland, arrived at Sparrow's Point, Md., in the British steamer Glenmavis last week. It is the first cargo of the ore shipped from the Conception Bay mines to the United States, and is the first consignment of 50,000 tons to be brought to that port for the Maryland Steel Co.

The Linden Steel Co.'s plant, Pittsburg, is out, undergoing extensive repairs.

To Picturesque Mackinac via the Coast Line.

It only costs $13.50 from Detriot, $15.50 from Toledo, $18 from Cleveland for the round trip, including meals and berths. One thousand miles of lake ride on new modern steel steamers for the above rates. Send 2c. for illustrated pmaphlet. Address A. A. Schantz, G. P. A., Detroit, Mich.

The Pennsylvania road will build eight engines at its own shops. The Carlisle Mfg. Co., Carlisle, Pa., has the order originally placed with the Middletown (Pa.) Car Works for 250 cars for the Pennsylvania.

D. & C. Summer Service to Mackinac.

Their new steel passenger steamers are all in commission, making four trips per week between Teledo, Dertoit, Mackinac, Soo, Petoskey, Duluth. If you are contemplating a summer outing, send 2c. stamp for illustrated pamphlet. Address A. A. Schantz, G. P. A., Detroit, Mich.

It has been erroneously stated that the firm of Jennings Brothers & Co., Ltd, which owns the West Penn Steel Works at Allegheny City and Leechburgh, Pa., had made an assignment; it has not done this, nor is the firm insolvent. The exact fact is that one or two parties to whom the firm owed a little money became impatient at its non-payment and brought suit for its recovery and judgment was confessed. A meeting of creditors will be held this week and an extension asked for, which will no doubt be granted. Both the plants of the firm are in good shape, with good orders in hand. The Pittsburg newspapers have greatly exaggerated a temporary embarassment to one of the most conservative and most reputable firms in the iron trade. We often wonder that our manufactrurers as a body stand the pressure of these hard times as well as they do.—[Bulletin.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

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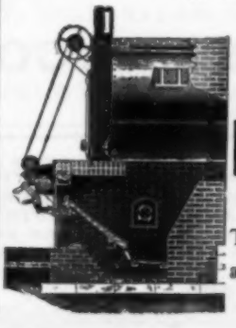

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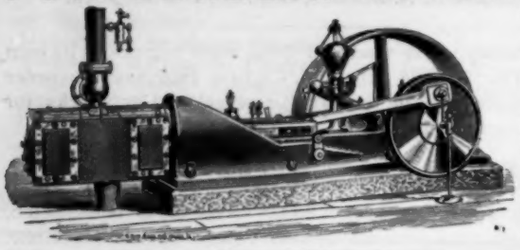
PORTER-ALLEN AUTOMATIC ENGINE.



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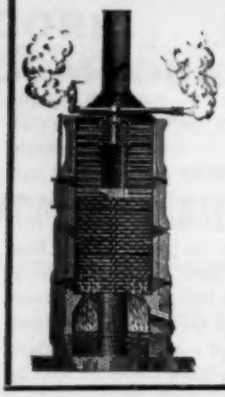

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PINE, CEDAR, CYPRESS OR CALIFORNIA RED WOOD TANKS

ALL STEEL OR COMBINED WOOD & IRON TOWERS

FIRE PROTECTION

By Elevated Tanks
and the Sprinkler System cuts your
INSURANCE RATES.

RED CEDAR TANKS.

Any Size up to 30 feet Diameter.

White Pine, ... Louisiana Cypress.

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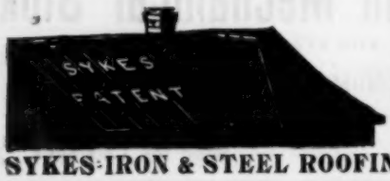

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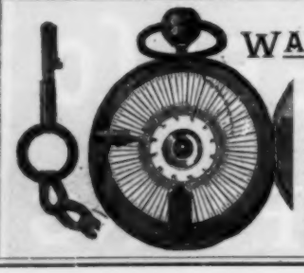

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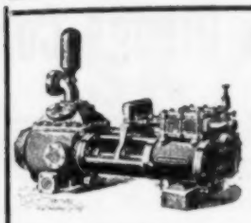

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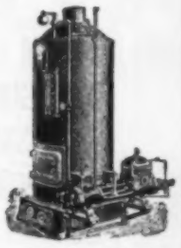

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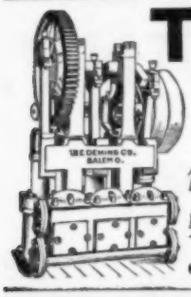

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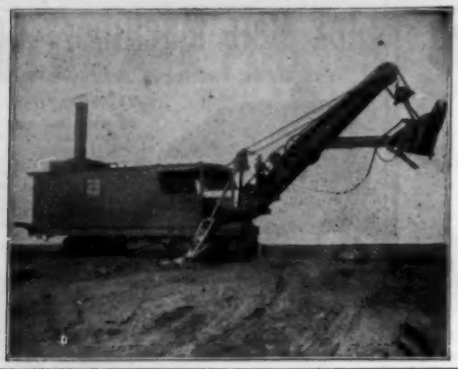

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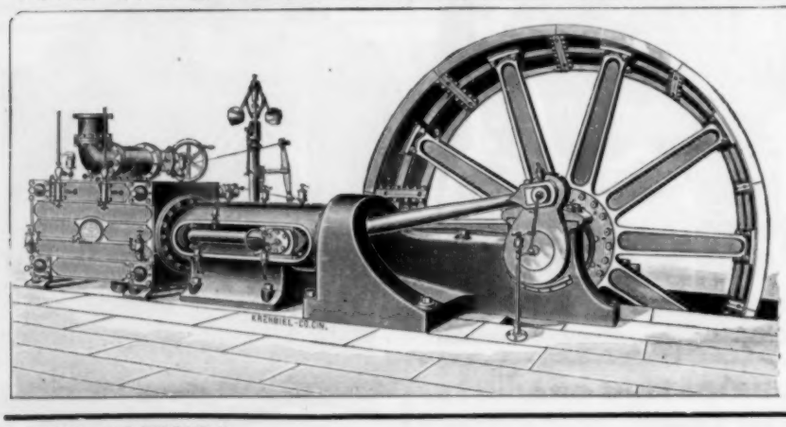

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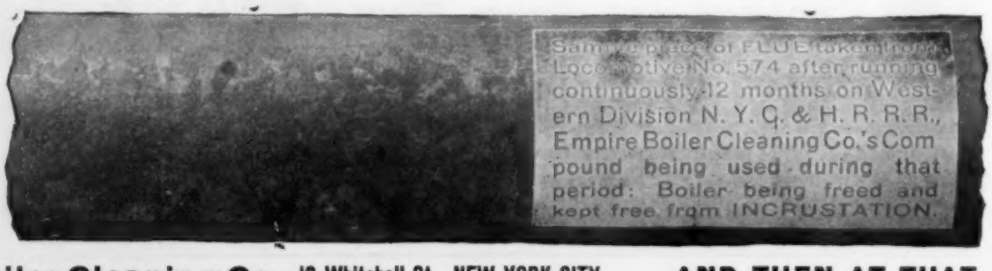
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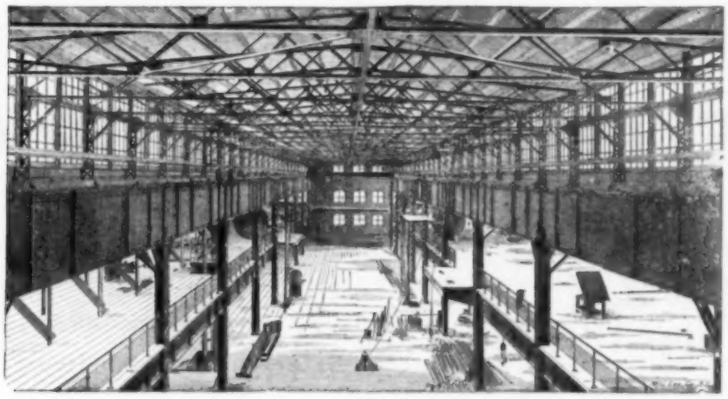

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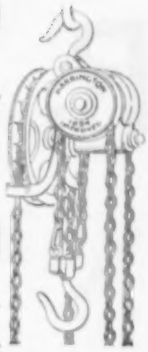

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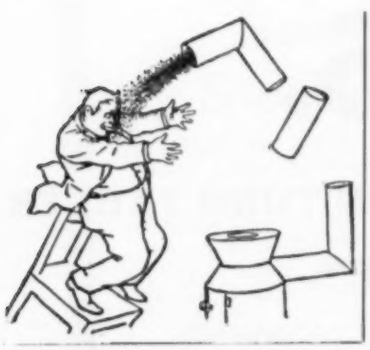

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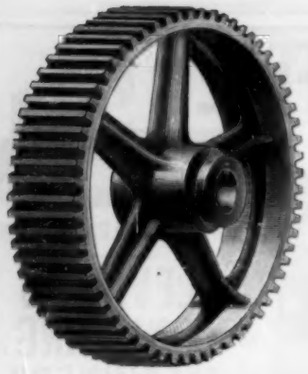

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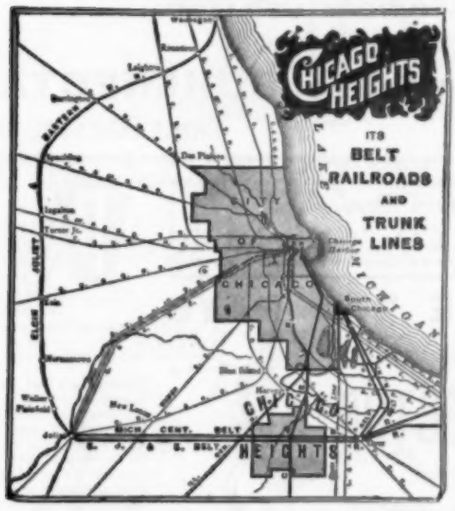

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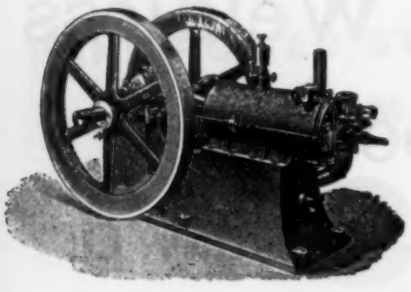

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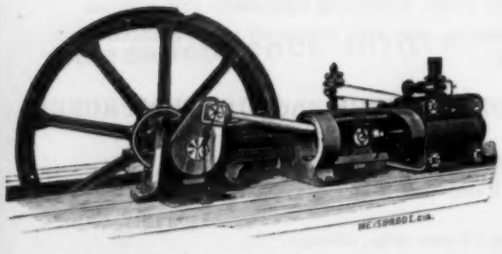

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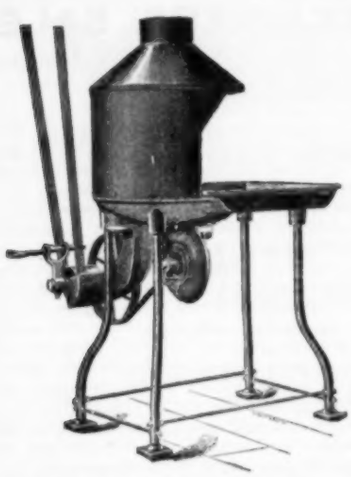

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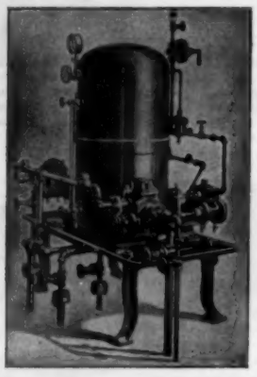

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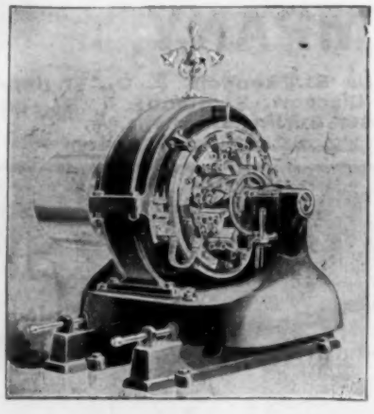

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RECEIVERS' SALE

THE SWANZY MINE OF THE ESCANABA RIVER LAND & IRON CO. FOR SALE.

TAKE NOTICE.

Whereas under and by virtue of an order of sale made by the Circuit Court for the county of Marquette, in Chancery, on the 12th day of March, A. D., 1896, in the cause then pending in said court wherein the Anthony Powder Company (Limited) is complainant and the Escanaba River Land & Iron Company is defendant, the receiver of all and singular the property of said Escanaba River Land & Iron Company theretofore appointed by said court to have and receive all the property of said company and abide the further order of said court was duly authorized and empowered to sell the mine, mine plant and real estate of said company situated in the township of Forsyth, in the county of Marquette and State of Michigan, on certain terms and conditions in said order set forth for the purpose of paying the debts of said corporation mentioned in said order together with the costs and expenses of such sale and of the said receiver subject to the approval of said court.

NOW THEREFORE, in pursuance with said order and for the purpose mentioned therein, I, Thomas M. Wells, the receiver mentioned in said order, hereby offer for sale, and will sell at public vendue upon proper and sufficient bid or bids received therefor, either for cash or on satisfactory terms of sale, such as may be approved by the Court, the following described real estate, mine and mining plant of said Escanaba River Land & Iron Company, to-wit: The southeast fractional quarter of section eighteen (18) in township forty-five (45), north of Range twenty-five (25), west in the county of Marquette and State of Michigan, the same being the Swanzy Mine, so-called, together with the machinery, boilers, pumps, engines and all connections, pipes, fixings, fixtures and appurtenances and all tracks, tools, appliances and structures of every kind constituting the mine plant located on said above described land; also all materials and supplies on hand consisting of fuel and other property required for use in operating the mine which maybe on hand at the time of said sale, said materials or supplies to be sold as such as personal property on the premises, but said mining machinery, pumps and engines and all other property constituting the plant for operating the mine on the premises to be sold as part and parcel thereof in one lump with the land above described, such sale or offer of sale to take place and be made at the front door of the court house in the city of Marquette, in said county and State, on Friday, the twenty-fourth day of July, 1896, at twelve (12) o'clock noon of said day. The sale of said material and supplies being personal property, shall take place on the premises at the mine location of said Escanaba River Land & Iron Company, in the township of Forsyth, Marquette County, Michigan, on Saturday, the twenty-fifth day of July, A. D., 1896, at the hour of twelve (12) o'clock noon of said day.

The mining plant aforesaid consists of the following: Two 5 ft. by 16 ft. boilers; one 10 x 16 duplex hoisting engine; two four-foot hoisting drums; one air compressor; three power drills; one No. 10 Cameron pump, two No. 7 Knowles pumps; two 1 and 1½ ton skips; together with all connections, pipes, fittings, wire rope, and all shaft houses, buildings, dwellings, and all structures of every kind and description, and all other property of every kind constituting the mining plant on said premises.

Specifications and descriptions of the materials and supplies on hand at the time of such sale will be furnished bidders for inspection at the front door of the court house in the city of Marquette at twelve (12) o'clock noon on the twenty-fourth day of July, A. D., 1896, at the time of offer of sale of said mine and plant.

The receiver at such sale reserves the right to require a deposit of five thousand dollars to be made by the successful bidder at the time of such sale to remain on deposit with said receiver pending the final confirmation of such sale by the Court, the same to apply on the purchase price in case of confirmation of sale and to be returned to the bidder in case of rejection of said bid.

Dated Negaunee, Michigan, June 5th, 1896.

T. M. WELLS, Receiver Escanaba River Land & Iron Co.

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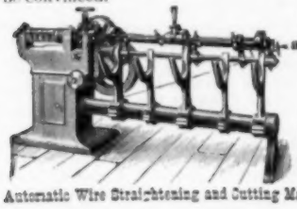

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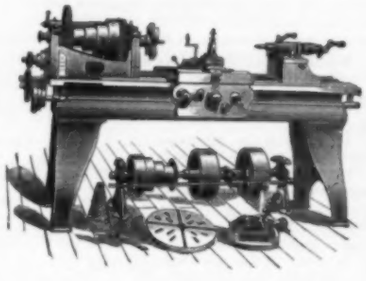

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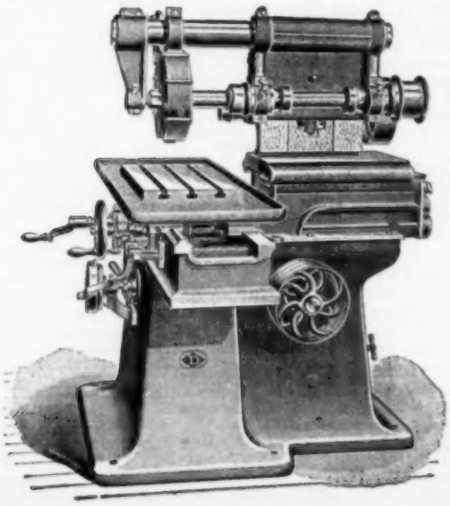

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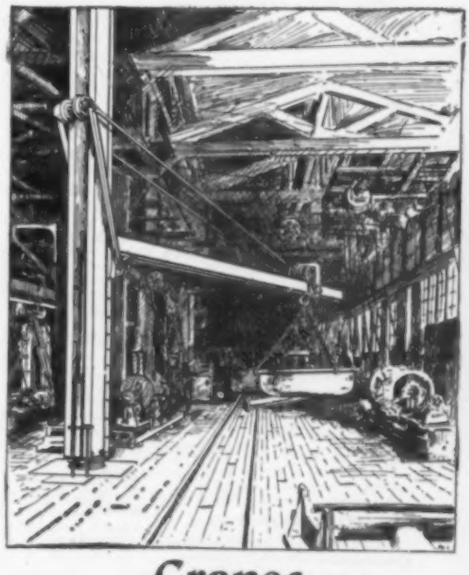

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Link-Belt Machinery Co. Chicago, Ill.

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Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
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Springfield Machine Tool Co., Springfield, O.
Edwin Harrington, Son & Co., Philadelphia.

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C. H. Besly & Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
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Lodge & Shipley Machine Tool Co., Cincinnati
C. H. Haeseler & Co., Philadelphia, Pa.
Springfield Machine Tool Co., Springfield, O.

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Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
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Hamilton Fdy. & Machine Co., Hamilton, O.
Springfield Machine Tool Co., Springfield, O.
Atwood & M'Caffrey, Pittsburg, Pa.
The R. D. Nuttall Co., Allegheny, Pa.

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Salem Wire Nail Co., Salem, O.

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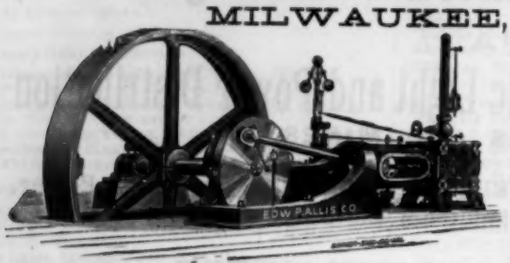

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[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4 50@ 4 75
No. 1 Bessemer hematite	4 00@ 4 25
Hematites No. 1 non-Bessemer	2 25@ 2 50
No 1. Specular, non-Bessemer	3 75@ 3 00

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Bessemer	$12 25@ 12 40
No. 1 Strong Foundry	12 00@ 12 25
No. 2 Strong Foundry	11 50@ 11 75
No. 1 Gray Forge, red short	10 15@ 10 40
No. 2 Gray Forge, neutral	10 00
No. 1 American Scotch	12 50
No. 2 American Scotch	11 75
Lake Superior Charcoal	13 50

PITTSBURG:

No. 1 Foundry	$12 00@ 12 25
No. 2 Foundry	11 50@ 11 75
Gray Forge	10 25@ 10 50
White and Mottled	10 00
Warm Blast Charcoal	15 00@ 16 00
Cold Blast Charcoal	20 00
Bessemer	12 25

CHICAGO:

Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	12 00@ 12 50
Local Coke Foundry No. 2	11 50@ 12 00
Local Coke Foundry No. 3	11 00@ 11 50
Local Scotch Foundry No. 1	12 00@ 12 50
Local Scotch Foundry No. 2	11 50@ 12 00
Local Scotch Foundry No. 3	11 00@ 11 50
Southern Coke No. 1	12 10@ 12 35
Southern Coke No. 2	11 60@ 11 85
Southern Coke No. 3	11 10@ 11 60
Southern No. 1 Soft	11 60@ 11 85
Southern No. 2 Soft	11 35@ 11 50
Southern Silveries No. 1	11 85@ 12 35
Southern Silveries No. 2	11 60@ 11 85
Jackson Co. Silveries	14 50@ 16 00
Ohio Silveries No. 1	15 00@ 15 50
Ohio Silveries No. 2	14 50@ 15 00
Ohio Strong Softeners	15 00@ 15 50
Alabama Car Wheel	16 85@ 17 35
Malleable Bessemer	13 00@ 13 50
Coke Bessemer	13 00@ 13 50

CINCINNATI (reported by Rogers, Brown & Co.)

Southern Coke No. 1, Foundry	$ $11 00
Southern Coke No. 2 and No. 1 Soft	10 50
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	13 00@ 14 00
Jackson County Silvery No 1	14 00@ 14 50
Southern Coke, Gray Forge	9 50
" " Mottled	9 50
Standard Alabama Car Wheel	15 00@ 16 00
Tennessee " "	14 00@ 15 00
Lake Superior " "	15 25@ 15 50

BUFFALO:

No. 1 Foundry Strong Coke Iron Lake Superior Ore	$13 00@13 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	12 50@ 12 75
Ohio Strong Softener No. 1	13 00@ 13 50
Jackson Co. Silvery No. 1	15 25@ 15 50
Lake Superior Charcoal	13 50@ 14 00
Southern Soft No. 1	12 15
Hanging Rock Charcoal	17 00

ST. LOUIS (reported by Rogers, Brown & Mencham):

Southern Coke No 1	$ $11 50
Southern Coke No. 2	11 00
Southern Coke No. 3	10 50
Southern Gray Forge	10 00
Southern Charcoal No. 1	15 00
Missouri Charcoal No. 1	14 00@ 15 00
Ohio Softeners	16 00
Lake Superior Car Wheel	15 00
Southern Car Wheel	16 25

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	GROSS TONS
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Old steel rails	12 00
Old car wheels	12 50
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Axle turnings	8 50
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Cast borings	6 50
Uncut wrought iron boilers	4 00
Steel boiler plates	10 00
Grate bars	6 75
Pipes and flues (clean)	9 00
Tank iron	9 00
Hoop and band iron	7 00
Sheet iron	6 50
Wrought drillings	7 50
Malleable iron	10 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.65c
Angles	1.29c
Tees	1.50c
Universal Plates	1.30@1.35c
Sheared Plates	1.40c

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[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4½ to 6 by ⅜ to 1 inch	1 35
1½ to 6 by 1¼ to 2 inch	1 35
1¼ & 1⅜ by ⅜ to ¼ inch	1 20
1 & 1¼ by ⅜ to ¼ inch	1 20
⅛, ¾, ⅞, by ⅜ to ½ inch	1 20

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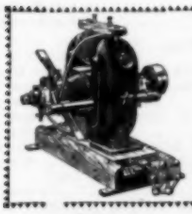

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USED BY NEARLY ALL THE RAILROADS.

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1 to 1⅜ inch	1 10
2 to 2¾ inch	1 30
2¾ to 3¼ inch	1 25
3¾ to 4 inch	1 60
4⅛ to 4⅝ inch	2 20
4⅝ to 5 inch	2 40

Oval.

⅜ to 1¼ inch	1 30
⅝ to ¾ inch	1 30
½	1 50
⅝	1 70

Half Oval and Half Round.

1¼ to 3 inch	1 65
⅜ to 1¼ inch	1 45
⅝ to ¾ inch	1 70
½	1 85
⅝	2 90

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 20
1 to 1¾ by ¼ and 5-16 inch	1 25
¾ to ⅞ by ¼ and 5-16 inch	1 35
½ to ⅝ by ¼ and 5-16 inch	1 60

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 35
1 7-16 to 2, No. 17, 18 and 19	1 40
1 7-16 to 2, No. 20	1 50
1 7-16 to 2, No. 21	1 60
1 7-16 to 2, No. 22	1 70
1¼ to 1⅜, No. 13, 14 and 15	1 40
1¼ to 1⅜, No. 16, 17 and 18	1 45
1¼ to 1⅜, No 19 and 20	1 50
1¼ to 1⅜, No. 21	1 60
1¼ to 1⅜, No. 22	1 70
15-16 and 1 inch, No. 13, 14 and 15	1 35
15-16 and 1 inch, No. 16, 17 and 18	1 50
15-16 and 1 inch, No. 19 and 20	1 60
15-16 and 1 inch, No. 21	1 70
15-16 and 1 inch, No. 22	1 80
⅞, No. 13, 14 and 15	1 60
⅞, No. 16, 17 and 18	1 70
⅞, No. 19 and 20	1 80
⅞, No. 21	1 90
⅞, No. 22	2 00
13-16, No. 13, 14 and 15	1 70
13-16, No. 16, 17 and 18	1 80
13-16, No. 19 and 20	1 90
13-16, No. 21	2 00
13-16, No. 22	2 10
¾, No. 13, 14 and 15	1 80
¾, No. 16, 17 and 18	1 95
¾, No. 19 and 20	2 05
¾, No. 21	2 15
¾, No. 22	2 25
11-16, No. 13, 14 and 15	2 05
11-16, No. 16, 17 and 18	2 10
11-16, No. 19 and 20	2 20
11-16, No. 21	2 30
11-16, No. 22	2 40
11-16, No. 23	2 50
⅝, No. 13, and 15	2 10
⅝, No. 16, 17 and 18	2 20
⅝, No. 19 and 20	2 30
⅝, No. 21	2 40
⅝, No. 22	2 50
⅝, No. 23	2 60
9-16, No. 13, 14 and 15	2 30
9-16, No. 16, 17 and 18	2 40
9-16, No. and 20	2 50
9-16, No. and	1 60
9-16, No. 221	2 70
9-16, No. 22	1 80
7-16 and ⅜ inch, No. 13, 14 and 15	2 50
7-16 and ⅜ inch, No. 16, 17 and 18	2 60
7-16 and ⅜ inch, No. 19 and 20	2 70
7-16 and ⅜ inch, No. 21	2 80
7-16 and ⅜ inch, No. 22	2 90
7-16 and ⅜ inch, No. 23	3 00
⅜, No. 13, 14 and 15	2 90
⅜, No. 16, 17 and 18	3 00
⅜, No. 19 and 20	3 10
⅜, No. 21	4 50
⅜, No. 22	3 60
⅜, No. 23	3 75

Light Band.

1⅜ to 6 by ⅛ to 3-16 inch	1 60
1⅜ to 6 by Nos. 11 and 12	1 65
1 to 1⅜ by ⅛ to 3-16 inch	1 65
1 to 1⅜ by Nos. 11 and 12	1
⅞ and 13-16 by ⅛ to 3-16 inch	1
⅞ and 13-16 by Nos. 11 and 12	1 75
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
¾ and 9-16 by ⅛ to 3-16 inch	2 05
¾ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 50
⅞ inch, " " " " 13 and 14	1 60
¾ inch, " " " " 11 and 12	1 65
¾ inch, " " " " 13 and 14	1 75

Sheet Iron.

No. 10	1 45
No. 12	1 55
No. 14	1 65
No. 15-17	1 75
No. 18	1 90
No. 20	2 05
No. 22-24	2 15
No. 25-26	2 25
No. 27	2 35

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 60
Flange	1 70
Marine Flange	2 00
Fire Box	2 50

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1¼c. "
104 to 126 in. wide	special

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ROUND, SQUARE AND OCTAGON.	cts. lbs.
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9-16 to ⅞ in. "	08

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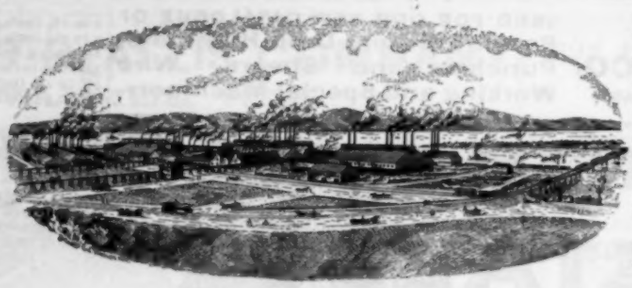

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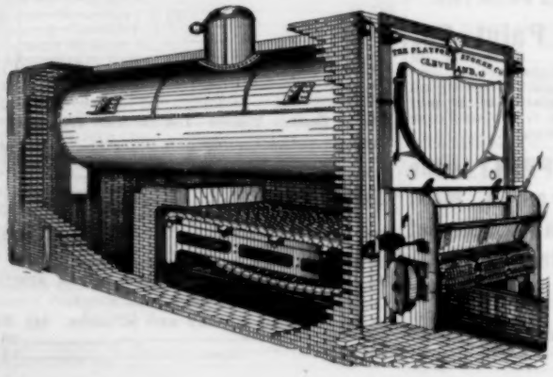

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3⅛ to 4 in	.09½
⅞ to 11-16 and 4⅛	.10
⅛ to 6 in	.10½
¼ to 9-32 and 6⅝ to 7 in	.11
7⅛ in	.13

Flats.

	cts. lbs
2 to 9-16 in. wide by 2 to ⅛ thick	.8

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Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 50
Open-hearth Spring	"	1 70
Sleigh Shoe	"	1 55
Toe Calk	"	1 65
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English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

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⅛, ⅜, 11-16 and ¾ inches diameter	3 30
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Lap weld black, base	dis. 65
Butt " " "	dis.
Lap " galv. "	dis. 52½
Butt " " "	dis. 50
Boiler tubes 2¼" and smaller	dis. 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

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Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

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	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

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Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

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B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

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Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

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Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

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Kegs, ₩ lb	4½c	5 c	2¾c
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¼ kegs ₩ lb	5 c	5½c	3 c
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Hamden ..... dis 60&10@75
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1897 ..... dis 50
Heavy hammers and sledges under 5 lbs 12c
" " " " over 5 lbs 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3½	3⅛
Hexagon	15½	11¼	8¼	6	5¼	5¼	
Washers	9	8	7	5	4⅛	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

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Standard Penny Nails, ₩ keg card rate
Car lots $2.55
Less than car lots $2 65

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Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
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Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 40
Copper ..... dis 40
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ₩ lb dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&15
Agricultural ..... dis 75&15
Mechanic's ..... dis 55&10&5
Bemis & Call's Combination ..... dis 30
Donohue's Engineers ..... dis 20&15
Lamson & Sessions Engineers ..... d's 65
Billings & Spencer's Drop Forged ..... dis 20
William's " " ..... dis 25
Alligator " " ..... dis 40

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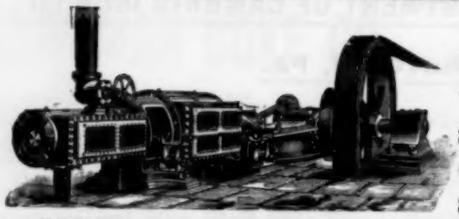

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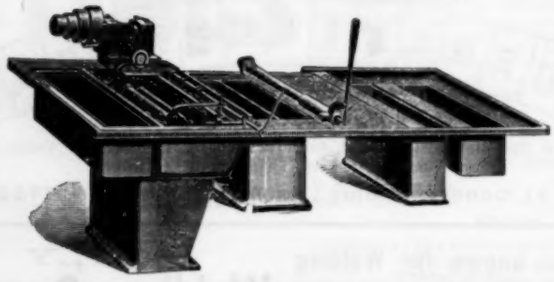

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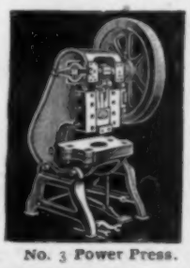

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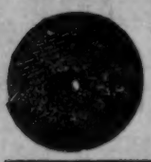

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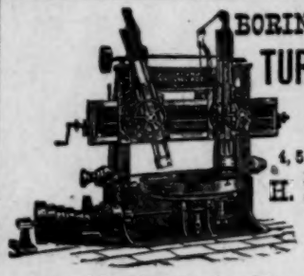

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